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NOTES ON GEOGRAPHIC DISTRIBUTION

First records of eight native bee species (Hymenoptera, Anthophila) in Washington, USA

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Abstract. Pollinators are an essential component of ecosystem function, and declining bee populations are a global conservation concern. Despite this importance, there is a lack of understanding regarding the distribution of native bee species across western North American landscapes. This study documents new records of *Melissodes nigracauda* LaBerge, *Dufourea dilatipes* Bohart, *Atoposmia abjecta abjecta* Cresson, *Coelioxys funerarius* Smith, *Dianthidium cressonii* Dalla Torre, *Dianthidium singulare* Cresson, *Osmia cyaneonitens* Cockerell, and *Stelis heronae* Sheffield. These eight new records supplement the ~565 bee species previously documented in Washington state.

Key words. Anthophila, biodiversity, conservation, native bees, pollinators, state records

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INTRODUCTION

Bees are globally important and contribute to essential ecosystem services. However, distributional knowledge for many bee species is limited. Systematically documenting regional bee faunas is vital for monitoring ecosystem health and provides a foundation for detecting declines in biodiversity (Mathiasson and Rehan 2019; Decker et al. 2020).

Washington is an ecologically diverse state characterized by wet western coastal forests and a dry eastern interior, generally separated by the Cascade Mountain Range (Franklin and Dryness 1973). Located on the eastern slopes of the Cascades, Chelan County is a landscape dominated by dry *Pinus ponderosa* Douglas ex. C. Lawson (Pinaceae) forest and *Artemisia* L. (Asteraceae) steppe (Franklin and Dryness 1973). While xeric landscapes typically contain high bee biodiversity (Michener 1979; Cane 2011), bees in Chelan County are understudied (Bartholomew et al. 2024). One of the main disturbances that affects native bee communities in this ecosystem is wildfire. When fire is restorative, the effects on pollinator communities are generally positive (Peralta et al. 2017; Galbraith et. al. 2019; Gelles et al. 2022). However, disturbances like wildfire are predicted to become more frequent and intense as the climate continues to warm (Dale et al. 2001; Marlon et al. 2012; Seidl et al. 2017). Changing climate has also affected the distributional ranges of several bee species (Kuhlmann et al. 2012; Nooten and Rehan 2020), making fine-scale documentation of bee faunas essential to ensure the conservation and preservation of native biodiversity.

We report the first records of eight bee species for the state of Washington, USA: *Melissodes nigracauda* LaBerge, 1961 (Hymenoptera, Apidae), *Dufourea dilatipes* Bohart, 1948 (Hymenoptera, Halictidae), *Atoposmia abjecta abjecta* Cresson, 1878, *Coelioxys funerarius* Smith, 1854, *Dianthidium cressonii* Dalla Torre, 1896, *Dianthidium singulare* Cresson, 1879, *Osmia cyaneonitens* Cockerell, 1906, and *Stelis heronae* Sheffield, 2024 (Hymenoptera, Megachilidae).

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METHODS

Study sites ($n = 8$) in Chelan County, Washington were selected within the Okanogan–Wenatchee National Forest, with permission from the Entiat and Chelan United States Forest Service Ranger Districts. Six sites

were established in areas that were burned by wildfire within the last decade (Figure 1). In all selected study areas, dominant vegetation included Ponderosa Pine (*Pinus ponderosa* Douglas ex. C. Lawson, Pinaceae), Douglas-fir (*Pseudotsuga menziesii* (Mirb.) Franco, Pinaceae), Bearberry (*Arctostaphylos uva-ursi* L. Spreng, Ericaceae), Wax Currant (*Ribes cereum* Douglas, Grossulariaceae), Snowbrush Ceanothus (*Ceanothus velutinus* Douglas, Rhamnaceae), and Arrowleaf Balsamroot (*Balsamorhiza sagittata* Pursh, Asteraceae). We established and sampled two replicated plots across four randomly selected sites from 2021 to 2023.

In each plot, two pan traps and two blue vane traps were deployed. Traps were placed approximately 0.25–0.5 m above the ground to mirror average floral height. Pan and blue vane traps were deployed for 24–36 hours every two weeks, from late April to early August, to account for seasonal variation among species. Each pan trap contained two white, two fluorescent blue, and two fluorescent yellow cups, each with a capacity of ~96 mL. Pan and blue vane traps were filled with soapy water to ensure effective capture. Blue vane deployment was delayed by ~2 weeks to avoid destruction of early season *Bombus* Latreille, 1802 queens (Kimoto et al. 2012).

Upon collection of field data, samples were labeled with the collection date, study site, and plot. Field samples were transported to the lab and stored at 0 °C. Trap contents were then separated by taxonomic order and stored in vials containing 70% ethanol prior to identification. The specimens were rehydrated, dried, pinned, and labeled. Native bee pollinators (Hymenoptera, Anthophila) were identified to the species level using taxonomic keys (Appendix Table A1). The specific keys used to identify first records are as follows: *Melissodes* (LaBerge 1961); *Dufourea* (Dumesh and Sheffield 2012); *Coelioxys* (Baker 1975); *Dianthidium cressonii* (Schwarz 1926); *Dianthidium singulare* (Grigarick and Stange 1968); *Osmia* (Sandhouse 1939); and *Stelis* (Sheffield 2024). Voucher specimens were deposited in the M. T. James Entomological Collection at Washington State University in Pullman, Washington, USA (WSUC) and the United States Department of Agriculture, Agriculture Research Service, Pollinating Insects Collection (formerly Bee Biology and Systematics Laboratory) at Utah State University in Logan, Utah, USA (BBSL). All maps were generated using ArcGIS Pro v. 3.3.1 (Esri Inc., Redlands, CA, USA), with species distributional data aggregated by the Global Biodiversity Information Facility.

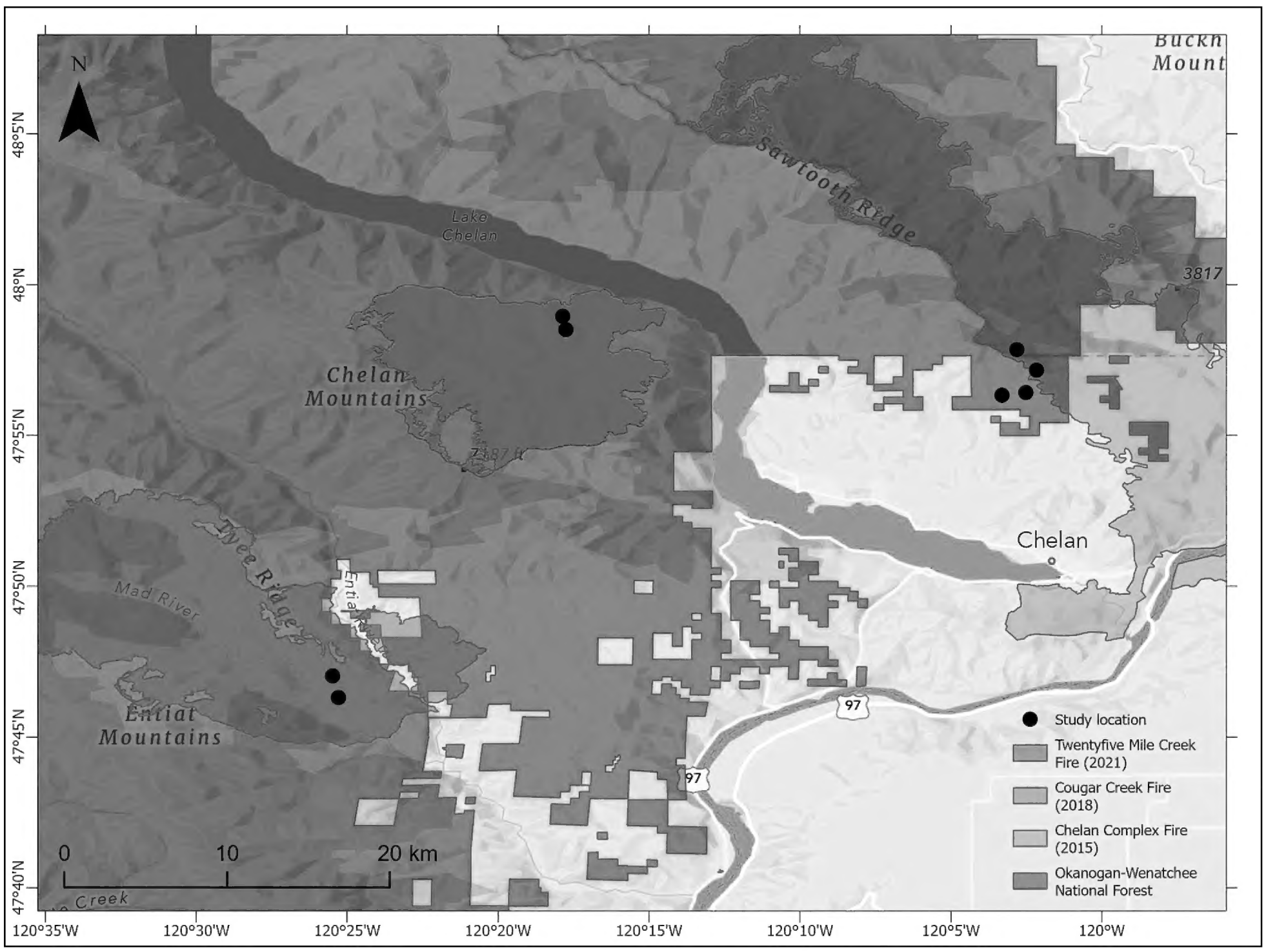

Figure 1. Study locations where first record species were collected in Washington, USA.

RESULTS

The result of these sampling efforts is the discovery of eight new records for Washington, USA described below. A complete list of new state records and their voucher locations are summarized in Table 1. Additionally, 100 new records for Chelan County, Washington, USA are reported in Table 2. A complete list of species collected and their abundance by year is provided in Table A2.

Table 1. First records of eight native bee species (Hymenoptera, Anthophila) collected in the Okanogan–Wenatchee National Forest in Chelan County, Washington, USA by determiners Autumn Maust (AM), Joel Gardner (JG), Karen W. Wright (KW), and Terry Griswold (TG). Due to a database error the specific locations within the study region cannot be determined for some specimens, and are listed as NA. Specimens were deposited in the M. T. James Entomological Collection at Washington State University in Pullman, Washington, USA (WSUC) and the United States Department of Agriculture, Agriculture Research Service, Pollinating Insects Collection (formerly Bee Biology and Systematics Laboratory) at Utah State University in Logan, Utah, USA (BBSL).

Family	Voucher ID	Species	Latitude (°N)	Longitude (°W)	Date of collection	Depository (determiner)
Apidae	AM21-0440	*Melissodes nigracauda*	NA	NA	2021*	WSUC (KW)
	AM21-1494	*Melissodes nigracauda*	NA	NA	2021†	WSUC (KW)
	AM21-1497	*Melissodes nigracauda*	NA	NA	2021†	WSUC (KW)
	AM21-1560	*Melissodes nigracauda*	47.7718	120.4216	3-Aug 2021	WSUC (KW)
	AM21-1561	*Melissodes nigracauda*	47.7718	120.4216	3-Aug 2021	WSUC (KW)
	AM22-1126	*Melissodes nigracauda*	NA	NA	2022‡	WSUC (KW)
	AM23-2436	*Melissodes nigracauda*	47.7718	120.4216	7-Aug 2023	WSUC (KW)
Halictidae	AM22-0786	*Dufourea dilatipes*	47.9526	120.0360	2022§	WSUC (KW)
	AM23-0471	*Dufourea dilatipes*	47.9388	120.0550	29-May 2023	WSUC (KW)
	AM23-0552	*Dufourea dilatipes*	47.9641	120.0469	29-May 2023	WSUC (KW)
	AM23-0596	*Dufourea dilatipes*	47.7837	120.4246	29-May 2023	WSUC (KW)
	AM23-1015	*Dufourea dilatipes*	47.7837	120.4246	12-Jun 2023	WSUC (KW)
Megachilidae	AM21-0062	*Atoposmia abjecta abjecta*	NA	NA	2021¶	WSUC (TG)
	AM21-0063	*Atoposmia abjecta abjecta*	NA	NA	2021¶	WSUC (TG)
	AM21-1507	*Atoposmia abjecta abjecta*	NA	NA	2021#	WSUC (TG)
	AM23-1376	*Atoposmia abjecta abjecta*	47.9526	120.0360	26-Jun 2023	WSUC (TG)
	AM23-1109	*Coelioxys funerarius*	47.9826	120.2978	12-Jun 2023	WSUC (TG)
	W21-0015	*Dianthidium cressonii*	47.9403	120.0418	6-Jul 2021	WSUC (KW)
	W21-0016	*Dianthidium cressonii*	47.9403	120.0418	6-Jul 2021	WSUC (KW)
	W21-0018	*Dianthidium cressonii*	47.9403	120.0418	6-Jul 2021	WSUC (KW)
	W21-0019	*Dianthidium cressonii*	47.7837	120.4246	6-Jul 2021	WSUC (KW)
	W21-0020	*Dianthidium cressonii*	47.7837	120.4246	6-Jul 2021	WSUC (KW)
	W21-0021	*Dianthidium cressonii*	47.7837	120.4246	6-Jul 2021	WSUC (KW)
	W21-0050	*Dianthidium cressonii*	47.9526	120.0360	22-Jun 2021	WSUC (KW)
	W21-0051	*Dianthidium cressonii*	47.9526	120.0360	22-Jun 2021	WSUC (KW)
	W21-0052	*Dianthidium cressonii*	47.9388	120.0550	22-Jun 2021	WSUC (KW)
	W21-0053	*Dianthidium cressonii*	47.9403	120.0418	22-Jun 2021	WSUC (KW)
	W21-0056	*Dianthidium cressonii*	47.9526	120.0360	6-Jul 2021	WSUC (KW)
	W21-0057	*Dianthidium cressonii*	47.9526	120.0360	6-Jul 2021	WSUC (KW)
	W21-0060	*Dianthidium cressonii*	47.7718	120.4216	6-Jul 2021	WSUC (KW)
	W21-0061	*Dianthidium cressonii*	47.9641	120.0469	22-Jun 2021	WSUC (KW)
	W21-0063	*Dianthidium cressonii*	47.9641	120.0469	22-Jun 2021	WSUC (KW)
	W21-0064	*Dianthidium cressonii*	47.9641	120.0469	22-Jun 2021	WSUC (KW)
	W21-0067	*Dianthidium cressonii*	47.9388	120.0550	6-Jul 2021	WSUC (KW)
	W21-0070	*Dianthidium cressonii*	47.9388	120.0550	8-Jun 2021	WSUC (KW)
	W21-0072	*Dianthidium cressonii*	47.9403	120.0418	8-Jun 2021	WSUC (KW)
	W21-0073	*Dianthidium cressonii*	47.7837	120.4246	22-Jun 2021	WSUC (KW)
	W21-0074	*Dianthidium cressonii*	47.7837	120.4246	22-Jun 2021	WSUC (KW)
	W22-0109	*Dianthidium cressonii*	47.9403	120.0418	1-Aug 2022	WSUC (KW)

Family	Voucher ID	Species	Latitude (°N)	Longitude (°W)	Date of collection	Depository (determiner)
	W22-0111	*Dianthidium cressonii*	47.9388	120.0550	1-Aug 2022	WSUC (KW)
	W22-0112	*Dianthidium cressonii*	47.9388	120.0550	1-Aug 2022	WSUC (KW)
	W22-0116	*Dianthidium cressonii*	47.9641	120.0469	1-Aug 2022	WSUC (KW)
	W22-0130	*Dianthidium cressonii*	47.9641	120.0469	18-Jul 2022	WSUC (KW)
	W22-0131	*Dianthidium cressonii*	47.9641	120.0469	18-Jul 2022	WSUC (KW)
	W22-0133	*Dianthidium cressonii*	47.9526	120.0360	1-Aug 2022	WSUC (KW)
	W22-0134	*Dianthidium cressonii*	47.9641	120.0469	1-Aug 2022	WSUC (KW)
	W22-0135	*Dianthidium cressonii*	47.9826	120.2978	1-Aug 2022	WSUC (KW)
	W23-0081	*Dianthidium cressonii*	47.9403	120.0418	10-Jul 2023	WSUC (KW)
	W23-0091	*Dianthidium cressonii*	47.9526	120.0360	12-Jun 2023	WSUC (KW)
	W23-0153	*Dianthidium cressonii*	47.9752	120.2959	26-Jun 2023	WSUC (KW)
	W23-0156	*Dianthidium cressonii*	47.9826	120.2978	26-Jun 2023	WSUC (KW)
	W23-0171	*Dianthidium cressonii*	47.7837	120.4246	26-Jun 2023	WSUC (KW)
	W22-0142	*Dianthidium singulare*	47.9403	120.0418	1-Aug 2022	WSUC (AM)
	AM23-0542	*Osmia cyaneonitens*	47.9526	120.0360	29-May 2023	WSUC (JG)
	AM22-0597	*Stelis heronae*	NA	NA	2022**	BBSL (TG)
	AM22-1314	*Stelis heronae*	NA	NA	2022††	WSUC (TG)
	AM23-1730	*Stelis heronae*	47.9388	120.0550	10-Jul 2023	BBSL (TG)
	AM23-1732	*Stelis heronae*	47.9388	120.0550	10-Jul 2023	WSUC (TG)

*Jun 8–Jul 6 2021; †Jun 8–Aug 3 2021; ‡Jul 5–Aug 1 2022; §May 10–Jul 5 2022; ¶Apr 28–Jul 6 2021; #Jun 22–Aug 3 2021; **Jul 18–Aug 1 2022; ††Jul 5–Aug 1 2022

Table 2. New records of 100 species in Chelan County, Washington, USA and their corresponding abundance by year. New records for the state of Washington are bold. Species that have not been documented in Washington since before the year 2000 are annotated (Bartholomew et al. 2024). Species-level identifications with ambiguity are omitted.

Family	Species	No collected 2021	No. collected 2022	No. collected 2023
Andrenidae	*Andrena angustitarsata*	2	1	0
	Andrena astragali	0	0	1
	Andrena buckelli	1	0	0
	Andrena candida	0	0	1
	Andrena candidiformis	0	3	1
	Andrena cleodora	0	1	0
	Andrena lawrencei	0	6	1
	Andrena lupinorum	3	0	0
	Andrena microchlora	1	0	0
	Andrena nivalis	1	5	1
	Andrena quintiliformis	0	5	0
	Andrena salicifloris	1	1	0
	Andrena schuhi	1	0	0
	Andrena trevoris	0	1	0
	Andrena vicinoides	0	1	0
	Panurginus atriceps	0	6	1
	Panurginus nigrellus	1	7	1
	Perdita wyomingensis sculleni	9	0	5
Apidae	*Anthophora terminalis*	0	1	1
	Ceratina nanula	5	1	2
	Ceratina sequioae*	2	1	3
	Eucera delphinii	1	7	1
	Habropoda morrisoni†	0	0	1

Family	Species	No collected 2021	No. collected 2022	No. collected 2023
	Melecta pacifica	4	1	9
	Melissodes communis	0	10	0
	Melissodes grindeliae/robustior	0	1	0
	Melissodes lupinus	0	0	1
	Melissodes nigracauda	5	1	1
Colletidae	*Colletes consors*	0	1	0
	Colletes fulgidus	0	1	2
	Hylaeus affinis[‡]	0	0	3
Halictidae	*Dufourea dilatipes*	0	1	4
	Halictus tripartitus	328	167	457
	Lasioglossum albohirtum	1	2	3
	Lasioglossum aspilurum[§]	1	1	2
	Lasioglossum athabascense	8	10	7
	Lasioglossum buccale[¶]	8	2	10
	Lasioglossum glabriventre	13	25	59
	Lasioglossum helianthi	2	0	3
	Lasioglossum inconditum[#]	0	11	1
	Lasioglossum knereri	2	3	20
	Lasioglossum macroprosopum	15	9	22
	Lasioglossum marinense	1	0	1
	Lasioglossum mellipes	13	16	15
	Lasioglossum pacificum	0	0	2
	Lasioglossum prasinogaster	6	6	7
	Lasioglossum pruinosum	1	0	2
	Lasioglossum punctatoventre	15	16	27
	Lasioglossum reasbeckae	1	1	6
	Lasioglossum ruidosense	14	7	5
	Lasioglossum sandhousiellum	19	4	9
	Lasioglossum trizonatum	14	22	11
Megachilidae	*Anthidium banningense*	2	0	3
	Anthidium formosum	1	0	2
	Anthidium mormonum	2	0	0
	Anthidium utahense	0	1	1
	Ashmeadiella californica	1	0	0
	Ashmeadiella cubiceps cubiceps	0	1	0
	Atoposmia abjecta abjecta	3	0	1
	Atoposmia elongata	1	0	0
	Coelioxys funerarius	0	0	1
	Coelioxys octodentata	0	1	0
	Dianthidium cressonii	21	9	5
	Dianthidium heterulkei	1	1	1
	Dianthidium pudicum	3	1	0
	Dianthidium singulare	0	1	0
	Dianthidium ulkei	1	0	0
	Heriades carinatus	0	1	0
	Hoplitis fulgida fulgida	3	3	1
	Hoplitis hypocrita	0	0	1
	Hoplitis producta	2	0	0

Family	Species	No collected 2021	No. collected 2022	No. collected 2023
	Hoplitis sambuci	0	2	2
	Megachile apicalis	0	0	1
	Megachile brevis	0	1	5
	Megachile gemula	0	1	0
	Megachile lapponica	0	1	0
	Megachile montivaga	4	6	3
	Megachile onobrychidis	2	0	0
	Megachile pascoensis	11	7	6
	Megachile subnigra	1	0	2
	Megachile wheeleri	0	0	1
	Osmia brevis	1	1	0
	Osmia bucephala	0	2	1
	Osmia cahuilla	0	0	1
	Osmia calla	1	1	3
	Osmia cara**	1	4	5
	Osmia cyaneonitens	0	0	1
	Osmia exigua	1	5	3
	Osmia kincaidii	0	0	1
	Osmia montana montana	5	15	108
	Osmia nanula	0	1	0
	Osmia nemoris	0	1	0
	Osmia nifoata	1	0	0
	Osmia proxima	1	0	0
	Osmia sedula	1	0	0
	Osmia simillima	0	0	1
	Osmia texana	0	1	0
	Osmia trevoris	2	1	5
	Stelis heronae	0	2	2
	Stelis subcaerulea	0	1	0

[*]Ceratina sequioae; not documented since 1919.
[†]*Habropoda morrisoni*; not documented since 1995.
[‡]*Hylaeus affinis*; not documented since 1970.
[§]*Lasioglossum aspilurum*; not documented since 1973.
[¶]*Lasioglossum buccale*; not documented since 1970.
[#]*Lasioglossum inconditum*; not documented since 1985.
[**]*Osmia cara*; not documented since 1935.

***Melissodes nigracauda* LaBerge, 1961**

Figure 2

New records. (*n* = 3♀). UNITED STATES OF AMERICA — **Washington** • Okanogan Wenatchee National Forest, Entiat Ranger District; Chelan County, Ardenvoir; 47.7718°N, 120.4216°W; 890 m a.s.l.; 2–4 Aug 2021; A. Maust leg.; blue vanes; det. KW Wright 2024; 2♀, AM21-1560 and AM21-1561 • ibid.; 7–9 Aug 2023; 1♀, AM23-2436.

Four additional specimens were captured, but due to a database error their specific locations within the Okanogan–Wenatchee National Forest in Chelan County, Washington cannot be determined. Three female specimens were collected in 2021 (AM21-0440, AM21-1494, and AM21-1497), and one male specimen was collected in 2022 (AM22-1126).

Identification. Females of *M. nigracauda* have black pile on the head, episterna, and metasoma, and brown to black scopa. Males have a long first flagellar segment and flattened segments 5–11 (LaBerge 1961). *Melissodes nigracauda* paratypes were borrowed from The University of Kansas Entomology Collection and directly compared to the Washington state specimens to confirm identification.

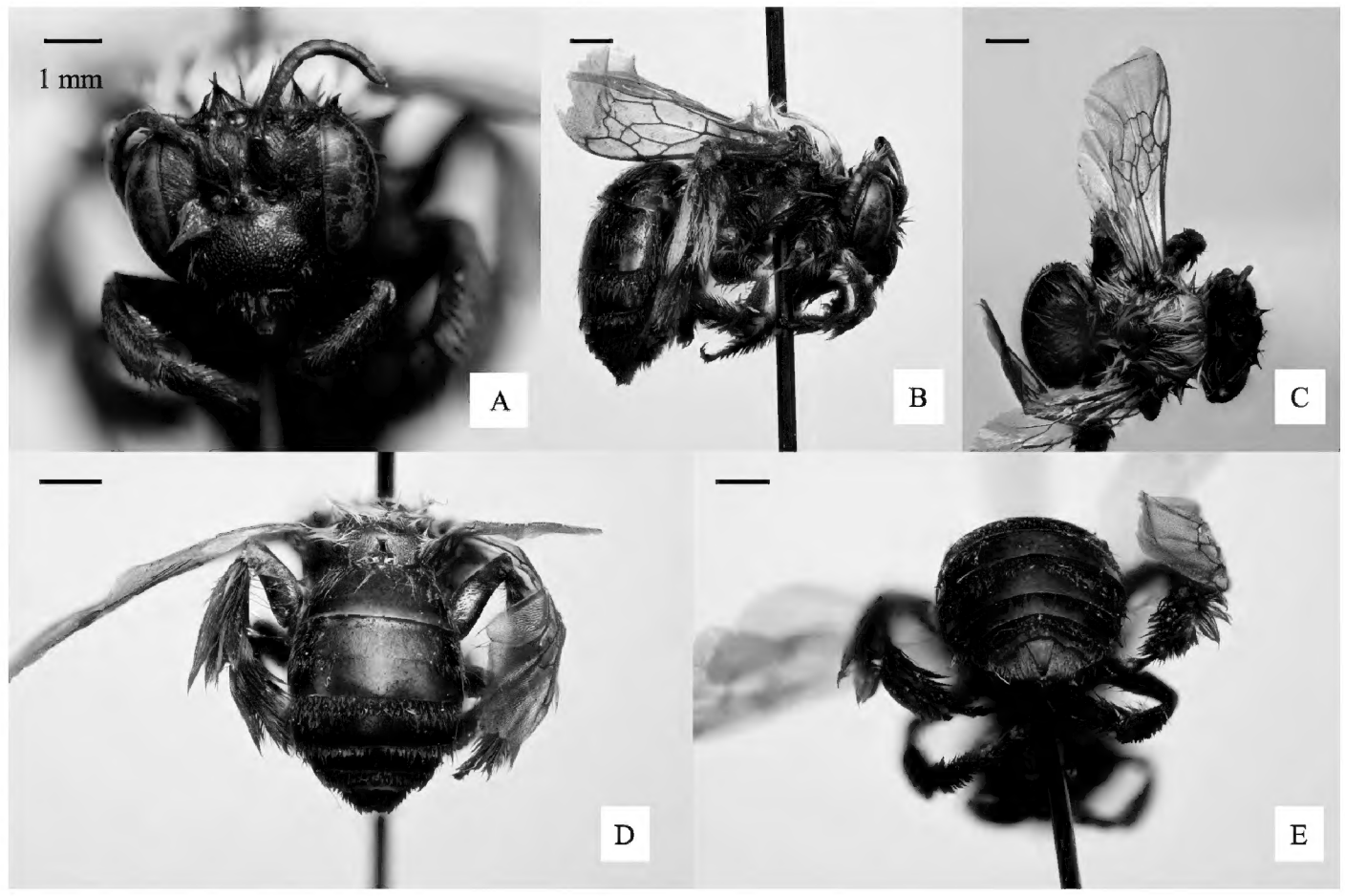

Figure 2. Female *Melissodes nigracauda*. **A.** Face, frontal view. **B.** Body, lateral view. Vestiture of the head, abdomen, and sides of the thorax dark brown to black. Scopa brown to black. **C.** Thorax, dorsal view. Dorsum of thorax ochraceous to slightly rufescent. **D.** Abdomen, dorsal view. Apical edges of tergites impunctate. **E.** Abdomen, dorsal view. Pygidial plate triangular. Scale is approximate.

Distribution. The previously known distributional range of *M. nigracauda* is California (LaBerge 1961, Figure 3). The nearest known location of *M. nigracauda* is ~1,105 km south of the Washington collection site in Contra Costa County, California, USA (37.87901°N, 121.9203°W, det. LaBerge 1959, Dombroskie 2024). The spatial distance between *M. nigracauda* populations in central Washington and California suggests that the two populations are genetically distinct, or that the intervening region is under sampled. Further investigations using DNA barcoding from specimens in each location coupled with increased sampling would ascertain the extent of genetic differences between these two populations.

Habitat. LaBerge (1961: 330) hypothesized that "this species is restricted to plants of the genus *Stephanomeria* Nutt. (Asteraceae) for sources of pollen. However, the data are as yet too sparse to come to a firm conclusion regarding oligolecty". *Stephanomeria* spp. have been recorded in Chelan County where the specimen was collected (Consortium of Pacific Northwest Herbaria 2024). LaBerge also noted other plants from which *M. nigracauda* has been collected, including species of *Erigeron* L. and *Senecio* L., both of which were present in the study area (personal observation).

Remarks. All specimens were collected in August, which aligns with the known phenology of *Melissodes* Latreille, 1829 as primarily late summer bees (Messinger Carril and Wilson 2023). The two female specimens

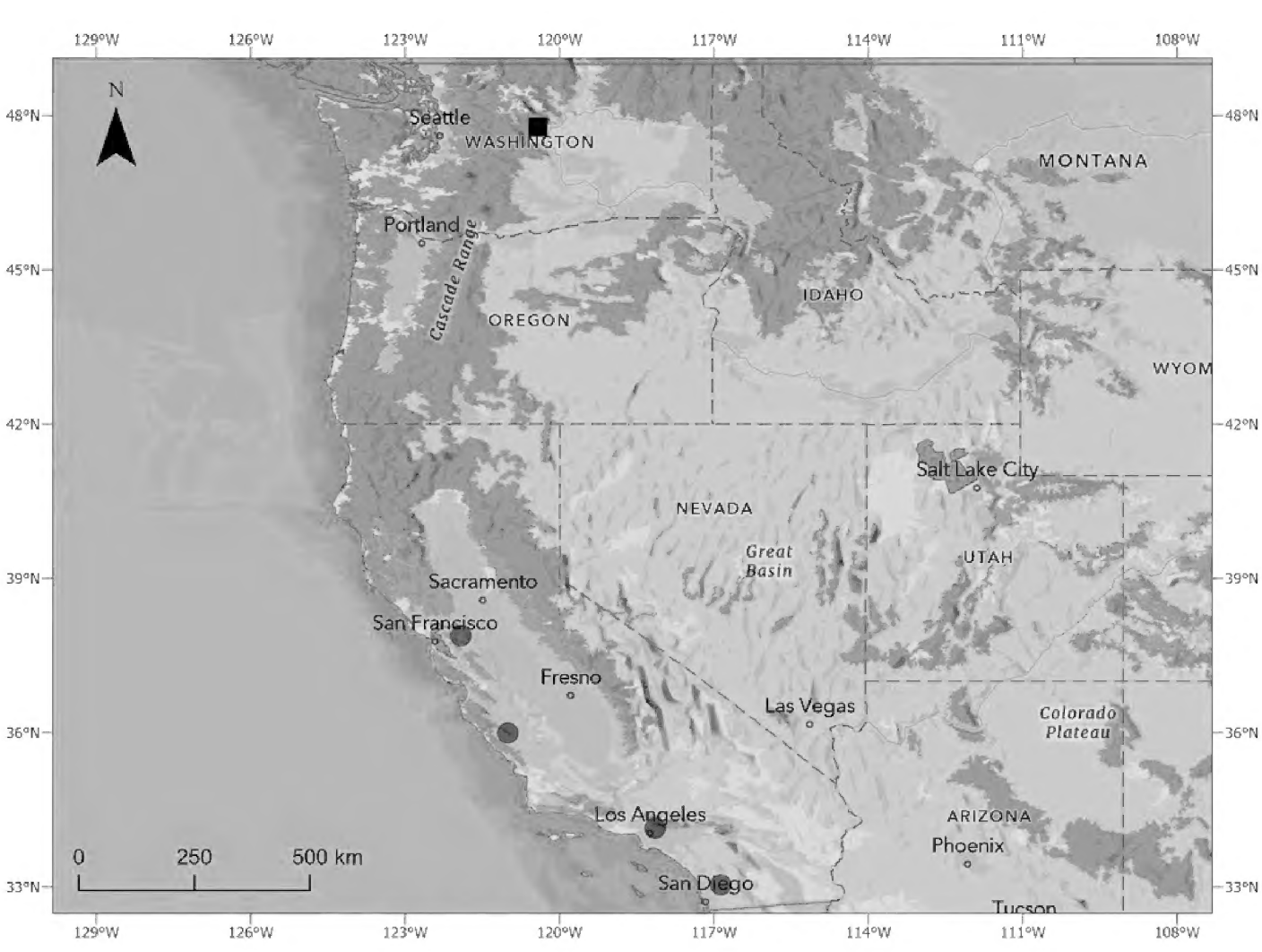

Figure 3. Known distribution of *Melissodes nigracauda* in North America (represented by gray circles) with new records in Washington state (black square). Known occurrence records were derived from Ikerd (2019) and Dombroskie (2024).

collected in 2021 were discovered in a landscape that was three years post-fire. The remaining female was collected from the same location two years later. The Cougar Creek Fire (2018) was located 32 km northwest of Entiat, Washington and consumed 16,760 ha., burning at moderate severity. This ground-nesting species either survived the soil heating by wildfire or recolonized within three years after the burn.

Dufourea dilatipes Bohart, 1948

Figures 4, 5

New records (*n* = 3♀, 2♂). UNITED STATES OF AMERICA — **Washington** • Okanogan Wenatchee National Forest, Chelan Ranger District; Chelan County, Chelan; 47.9525°N, 120.0360°W; 1060 m a.s.l.; May 10–Jul 5 2022; A. Maust leg.; det. KW Wright 2024; 1♀, AM22-0786 • ibid.; 47.9388°N, 120.0550°W; 850 m a.s.l.; 29–30 May 2023; 1♀, AM23-0471 • ibid.; 47.9641°N, 120.0470°W; 1160 m a.s.l.; pan traps; 1♂ AM23-0552 • ibid., Entiat Ranger District; Ardenvoir; 47.7837°N, 120.4246°W; 1010 m a.s.l.; 1♂ AM23-0596• ibid.; 47.7837°N, 120.4246°W; 1010 m a.s.l.; 12–13 Jun 2023; 1♀ AM23-1015.

Identification. *Dufourea dilatipes* are distinguished from other species in *Dufourea* Lepeletier, 1841 by the dark brown to black pubescence, including scopa. *Dufourea maura* is similarly dark, but females of *D. dilatipes* have a smoother, duller propodeum and a densely punctate scutellum, while male *D. dilatipes* have a greatly expanded, triangular metatibia (Dumesh and Sheffield 2012).

Distribution. The nearest known record of *D. dilatipes* is from southern British Columbia, Canada (49.025°N, 119.567°W, det. Sheffield, Sheffield, and Heron 2018), which is ~145 km from the collection location. *Dufourea dilatipes* has also been recorded in Shasta County, California, USA (41.0037°N, 121.9050°W, leg. Brown 1965, det. T. Griswold 2006, Ikerd 2019) and Montana, USA (48.4870°N, 113.3668°W, leg. Michener 1988, Ikerd 2019), which are ~777 km south and ~510 km east of the Washington study area, respectively (Figure 6).

Habitat. *Dufourea dilatipes* is oligolectic on Mariposa Lilies in the genus *Calochortus* Pursh (Liliaceae). Our findings concur, as *Calochortus lyallii* Baker, 1874 and *Calochortus macrocarpus* Douglas, 1828 are present on the landscape where *D. dilatipes* was collected (Consortium of Pacific Northwest Herbaria 2024; personal observation). *Dufourea dilatipes* is a ground nesting species that was detected only at study sites >5 years post-fire. This may indicate a sensitivity to soil heating or consumption by wildfire for both *D. dilatipes* and *Calochortus* species. The loss of *Calochortus* spp. on landscape due to wildfire would result in unsuitable habitat for *D. dilatipes*. However, one species in the genus, *Calochortus plummerae* Greene, has been documented one-year post-fire (Horton and Kraebel 1955; Williams et al. 2021), which suggests *Calochortus plummerae* seeds may be fire-adapted. As an alternate hypothesis, Cane and Neff (2011) observed that bees with nests >10cm beneath the soil horizon were insulated from soil heating. Little is known about the nesting habits of *D. dilatipes*; however, because this species was exclusively detected >5 years post-fire, it may have a shallow nest depth.

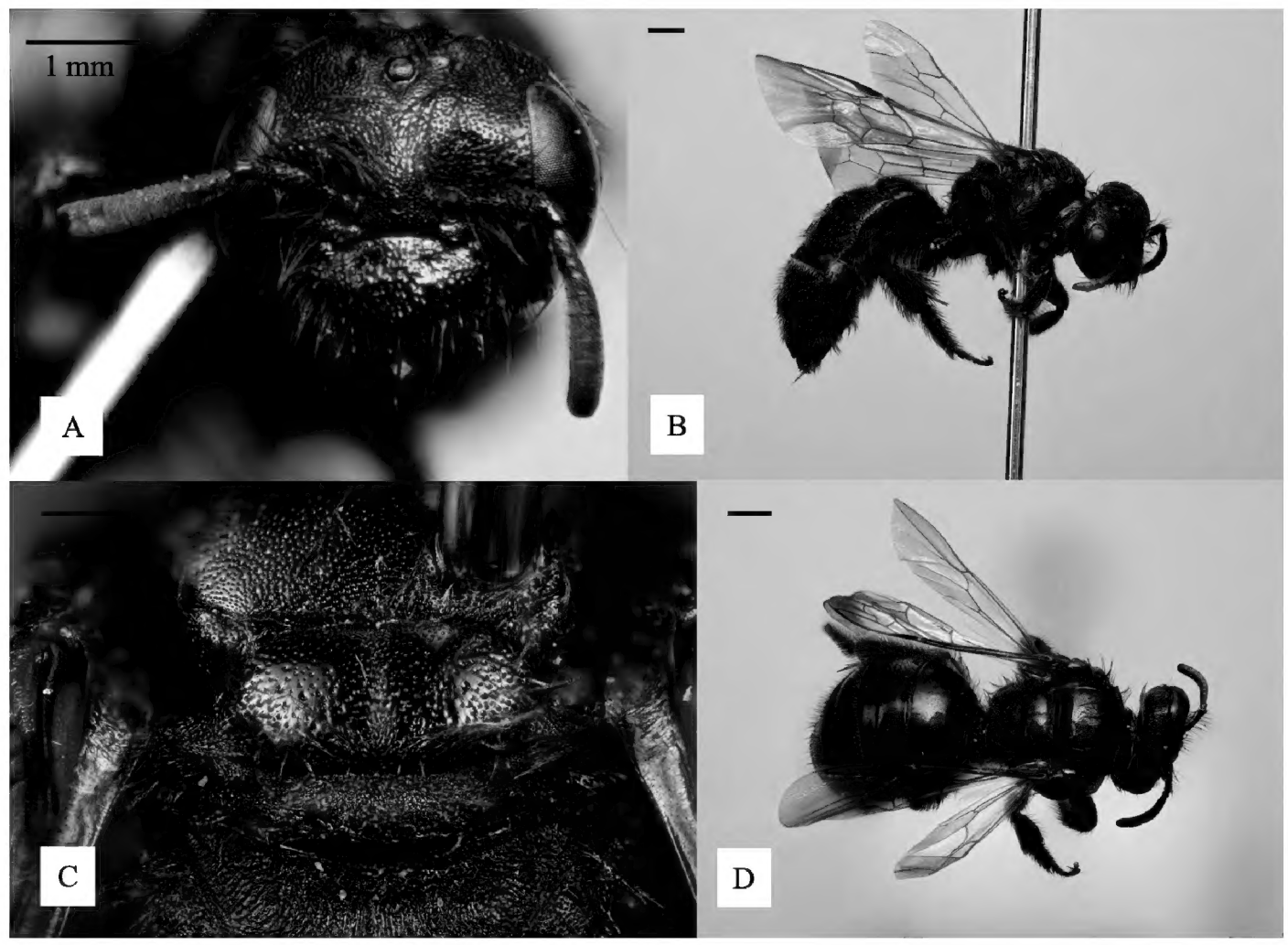

Figure 4. Female *Dufourea dilatipes*. **A.** Face, frontal view. Clypeus long. **B.** Lateral view, brown body pubescence **C.** Dorsal view, propodeal triangle dull. Mesoscutellum densely punctate. **D.** Dorsal view. Scale is approximate.

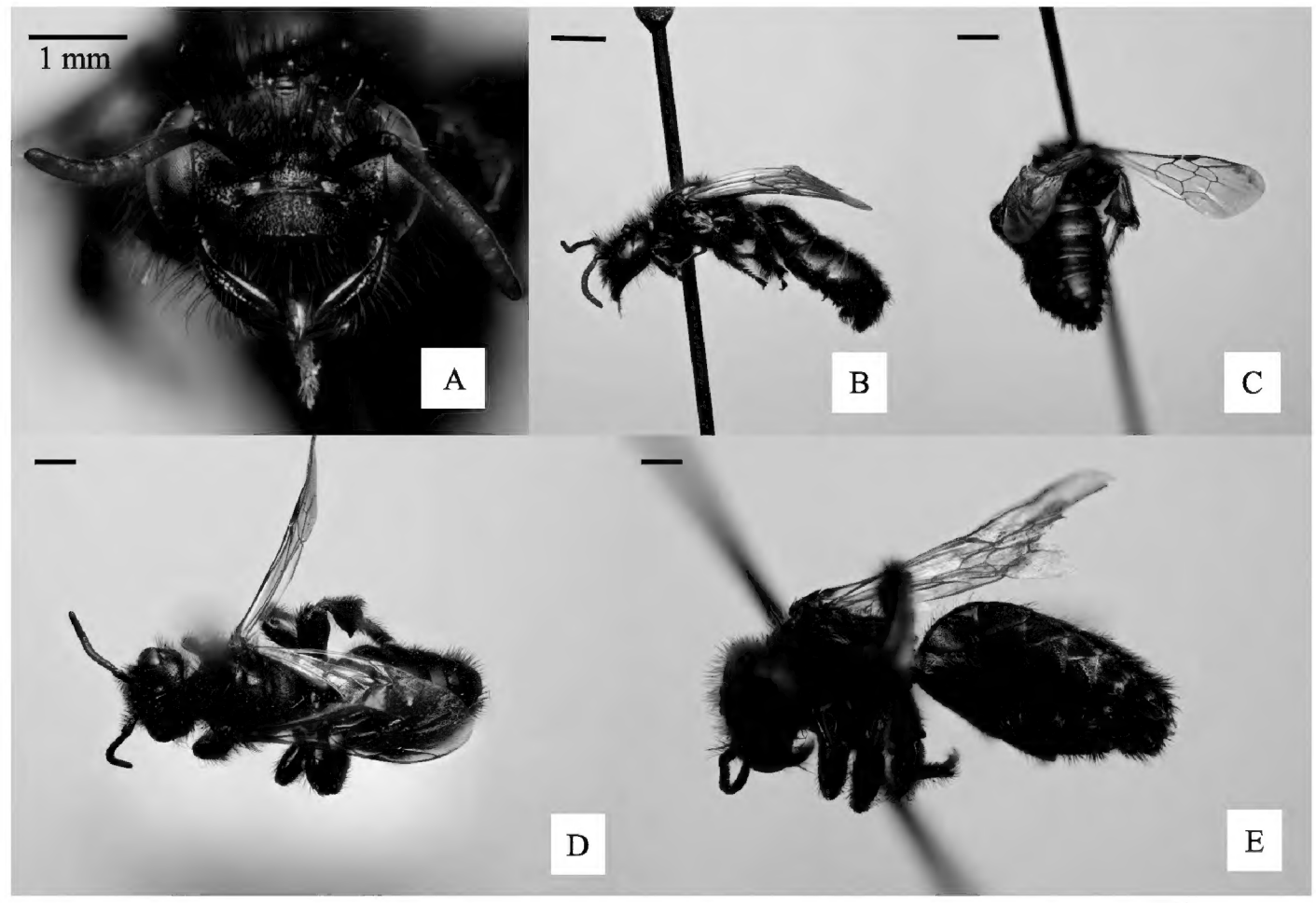

Figure 5. Male *Dufourea dilatipes*. **A.** Face, frontal view. Clypeus long. **B.** Lateral view, brown body pubescence. **C.** Hind leg with robust hind femur and triangular hind tibia **D.** Dorsal view, propodeal triangle dull. Mesoscutellum densely punctate. **E**. Ventral view, S4 with medial process on apical margin, S6 with medial process gradually curved. Scale is approximate.

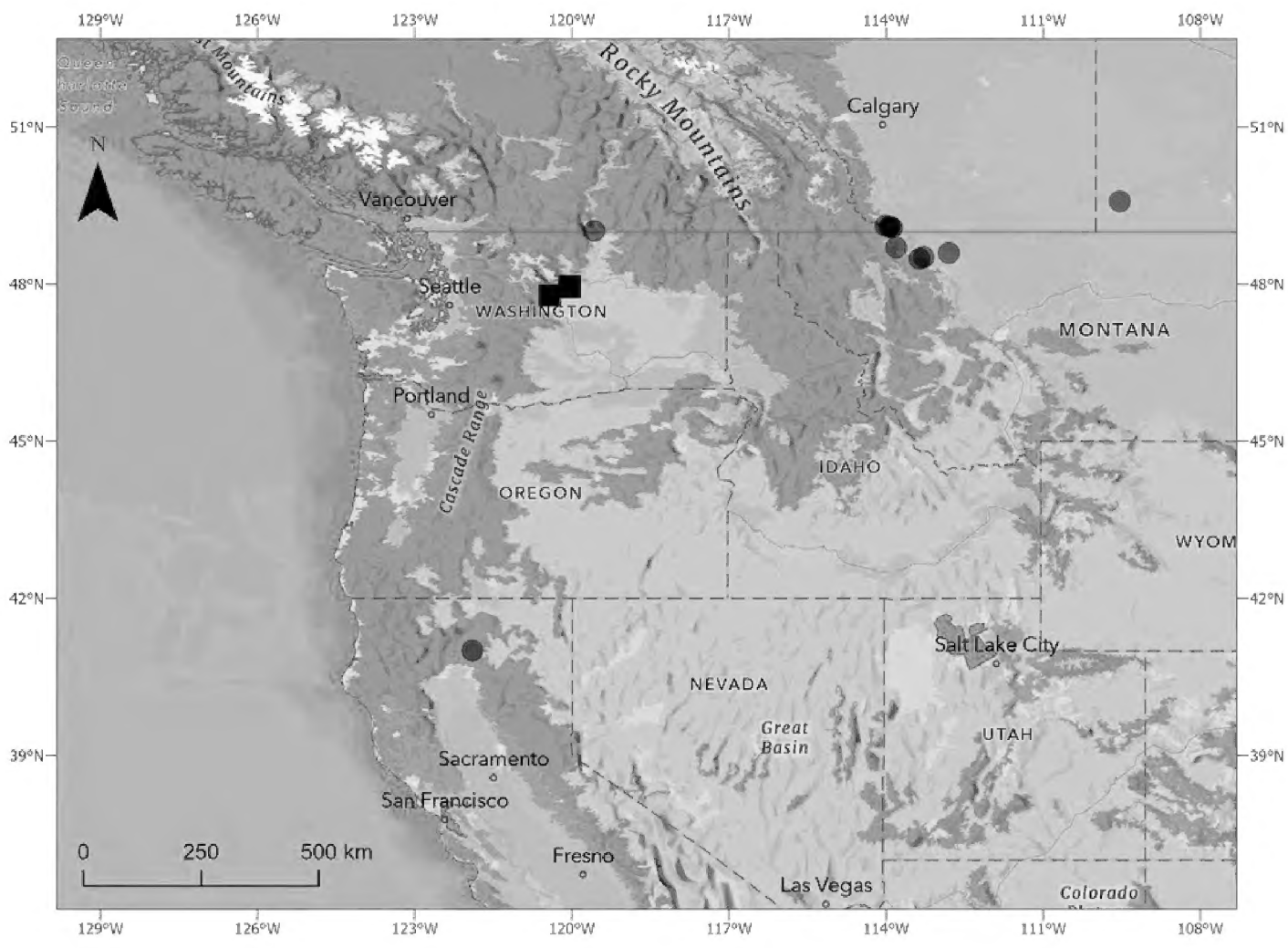

Figure 6. Known distribution of *Dufourea dilatipes* in North America (represented by gray circles) with new records in Washington state (black squares). Known occurrence records were derived from Sheffield and Heron (2018), Ikerd (2019), and Sheffield (2019).

Remarks. Due to a limited number of recorded observations, one could infer that *D. dilatipes* is a rare pollinator. Furthermore, the oligolectic behavior of this species emphasizes its importance for the conservation of native *Calochortus* species in dry forest landscapes.

***Atoposmia abjecta abjecta* Cresson, 1878**

Figure 7

New record. UNITED STATES OF AMERICA — **Washington** • Okanogan Wenatchee National Forest, Chelan Ranger District; Chelan County, Chelan; 47.9526°N, 120.0360°W; 1060 m a.s.l.; 26–27 Jun 2023; A. Maust leg.; blue vanes; det. T. Griswold 2024; 1♀, AM23-1376.

Three additional female *A. abjecta abjecta* specimens were captured in 2021, but due to a database error their specific locations within the Okanogan–Wenatchee National Forest in Chelan County, Washington cannot be determined. Two female specimens were collected between 28 April and 6 July (AM21-0062 and AM21-0063) and one female specimen was collected between 22 June and 3 August (AM21-1507).

Figure 7. Female *Atoposmia abjecta abjecta*. **A.** Face, frontal view. **B.** Mesoscutum, coarsely punctured. The central part with punctures separated by >2 puncture widths extending out to the parapsidal lines. **C.** Lateral view, scopa brownish black. **D.** Abdomen, lateral view. Scale is approximate.

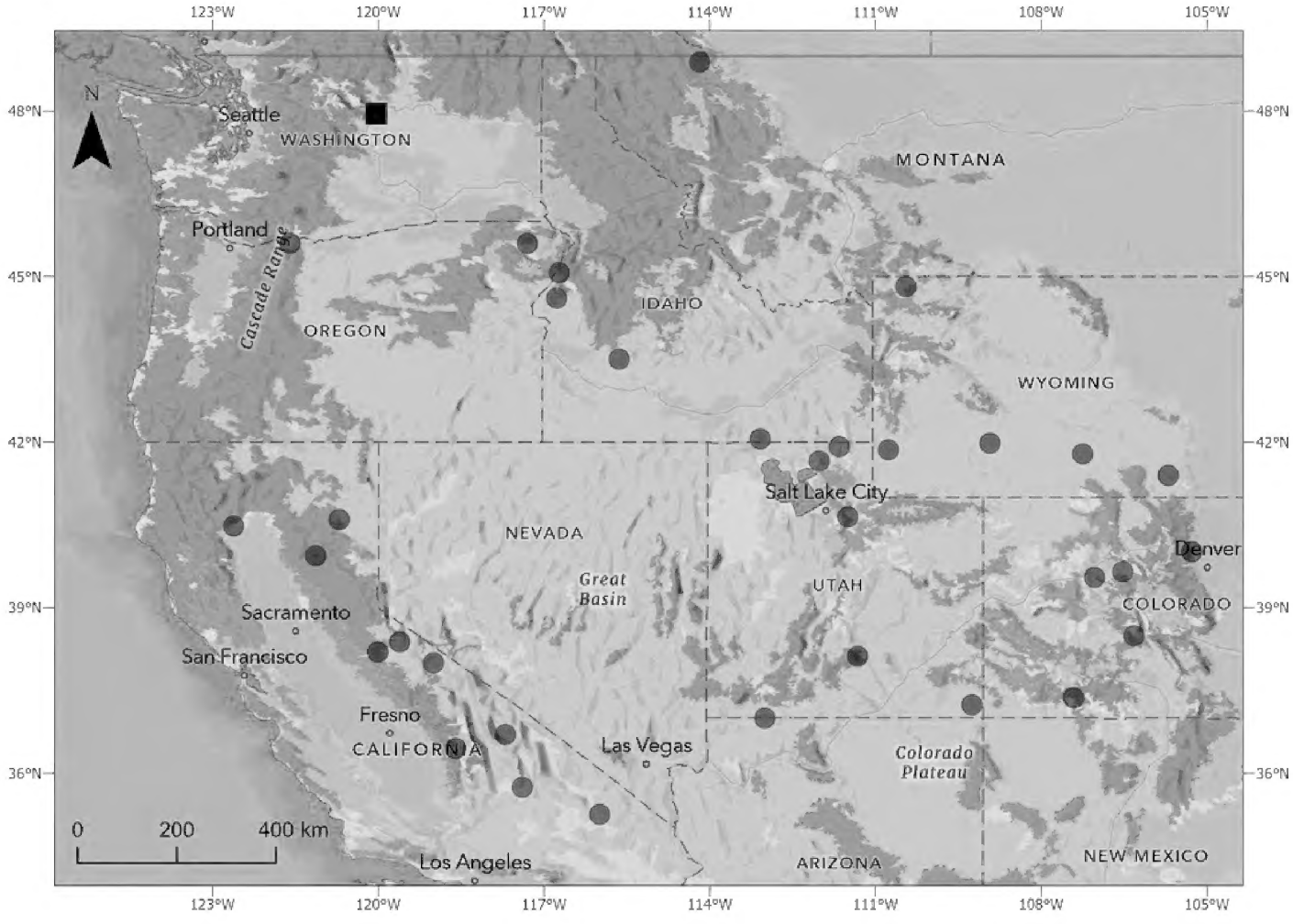

Figure 8. Known distribution of *Atoposmia abjecta abjecta* in North America (represented by gray circles) with new records in Washington state (black square). Known occurrence records were derived from Ikerd (2019), Best et al. (2022), and Bentley and Falin (2025).

Identification. Females of *Atoposmia abjecta abjecta* are diagnosed by the combination of dark scopa and coarse punctures on the mesoscutum. These punctures are often separated by two or more puncture widths and, in females, extend from the midpoint to the parapsidal lines. While *A. anthodyta* (Michener, 1943) and *A. oregona* (Michener, 1943) have similarly punctured mesoscuta, the punctures are closer and the mandibles, narrower (Hurd and Michener 1955).

Taxonomic remarks. *Atoposmia* was previously considered a subgenus of the genus *Anthocopa* by Hurd and Michener (1955).

Distribution. *Anthocopa* (*Atoposmia) abjecta* is reported as occurring in California, Colorado, Oregon, Utah, and Wyoming. The subspecies *A. abjecta abjecta* is present in California, Oregon, and east to the Rocky Mountains (Hurd and Michener 1955). Five specimens collected in Hood River County (45°N, 122°W, Best et al.

2022) are ~275 km southeast of the sampling area (Figure 8). A specimen has also been recorded in southern British Columbia (Sheffield and Heron 2018) which is at least 116 km from the collection location. This new record fills a gap in the known distributional range of *Atoposmia abjecta abjecta*.

Habitat. *Atoposmia abjecta* has been reported to occur in British Columbia's Montane Cordillera ecosystems, a category which includes conifer forests (Sheffield and Heron 2018). This aligns with vegetative observations from the study area, where Ponderosa Pine (*Pinus ponderosa)* was the dominant tree species.

Coelioxys funerarius Smith, 1854

Figure 9

New record. UNITED STATES OF AMERICA — **Washington** • Okanogan Wenatchee National Forest, Chelan Ranger District; Chelan County, Chelan; 47.9826°N, 120.2978°W; 980 m a.s.l.; 12–13 Jun 2023; A. Maust leg.; pan traps; det. T. Griswold 2024; 1♀, AM23-1109.

Identification. *Coelioxys funerarius* is the only species in the subgenus *Schizocoelioxys* Mitchell, 1973 that occurs in North America. Female specimens are distinguished by the moderately punctured scutum, which lacks fasciae, and the hump on the inner surface of the mandible (Baker 1975). *Coelioxys funerarius* resembles *C. moesta* Cresson, 1864 but is usually larger. Furthermore, the clypeus of female *C. funerarius* is convex with a slightly outcurved margin, while the female of *C. moesta* has a flat clypeus with a triangularly produced margin (Baker 1975).

Distribution. This is the first record of *C. funerarius* with known physical vouchers in the state of Washington. Two records of *C. funerarius* were published on a distribution map by Baker (1975). However, its presence could not be confirmed because the provenance of the voucher specimens associated with those records, if they exist, was not given and they could not be located. The nearest known record of *C. funerarius* were collected in British Columbia (Buckell 1950), approximately 400 km northeast of the study location. The known distribution of *Coelioxys funerarius* is shown in Figure 10.

Remarks. *Coelioxys funerarius* is a known cleptoparasite of five species of *Megachile* spanning three subgenera in North America: *M. rotundata* Fabricius, 1787, *M. inermis* Provancher, 1888, *M. relativa* Cresson, 1878, *M. frigida* Smith, 1853, and *M. latimanus* Say, 1823 (Baker 1975). Of these recorded hosts, *Megachile frigida*, *Megachile relativa,* and *Megachile rotundata* (Bartholomew et al. 2024) are present in Washington, though were not collected in this study. Due to the wide breadth of hosts, coupled with the extensive distributional range of the species, *C. funerarius* is considered a generalist parasite (Baker 1975). Therefore, it could likely attack any of the *Megachile* species found in this study as a host (Table A2).

Coelioxys funerarius was collected within the burn perimeter of the Twentyfive Mile Creek Fire, which burned 8,990 ha approximately 40 km west of Chelan, Washington, in August of 2021. The site at which *C. funerarius* was collected burned at moderate severity, which is higher than the historically low severity fire experienced by this landscape (Agee 1993). All hosts are known cavity-nesting species (Messinger Carril

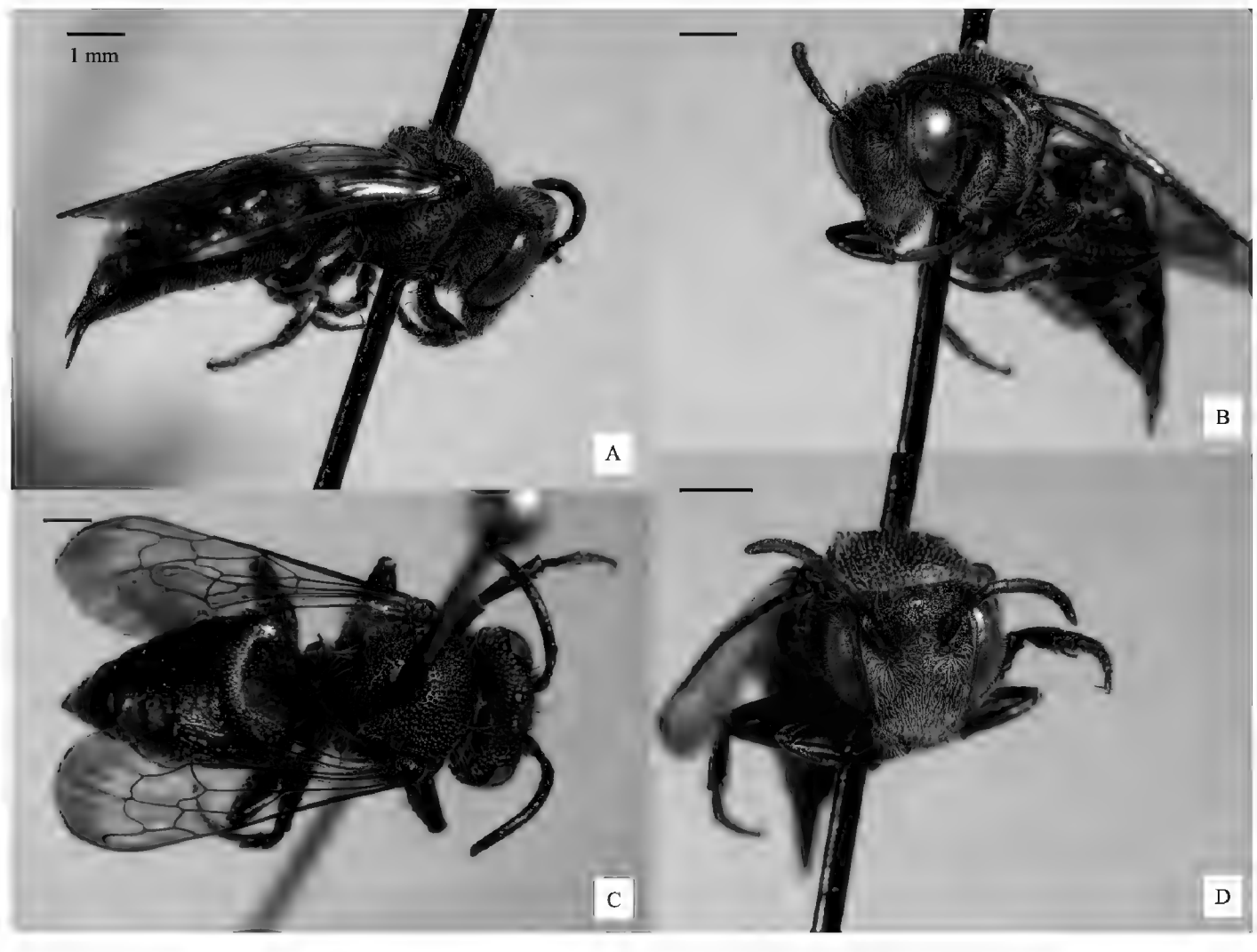

Figure 9. Female *Coelioxys funerarius*. **A.** Lateral view, clypeus convex, slightly outcurved margin. **B.** Face, frontal and lateral view. Axilla visible. **C.** Dorsal view, fasciae on the scutum absent. **D.** Face, frontal view. Scale is approximate.

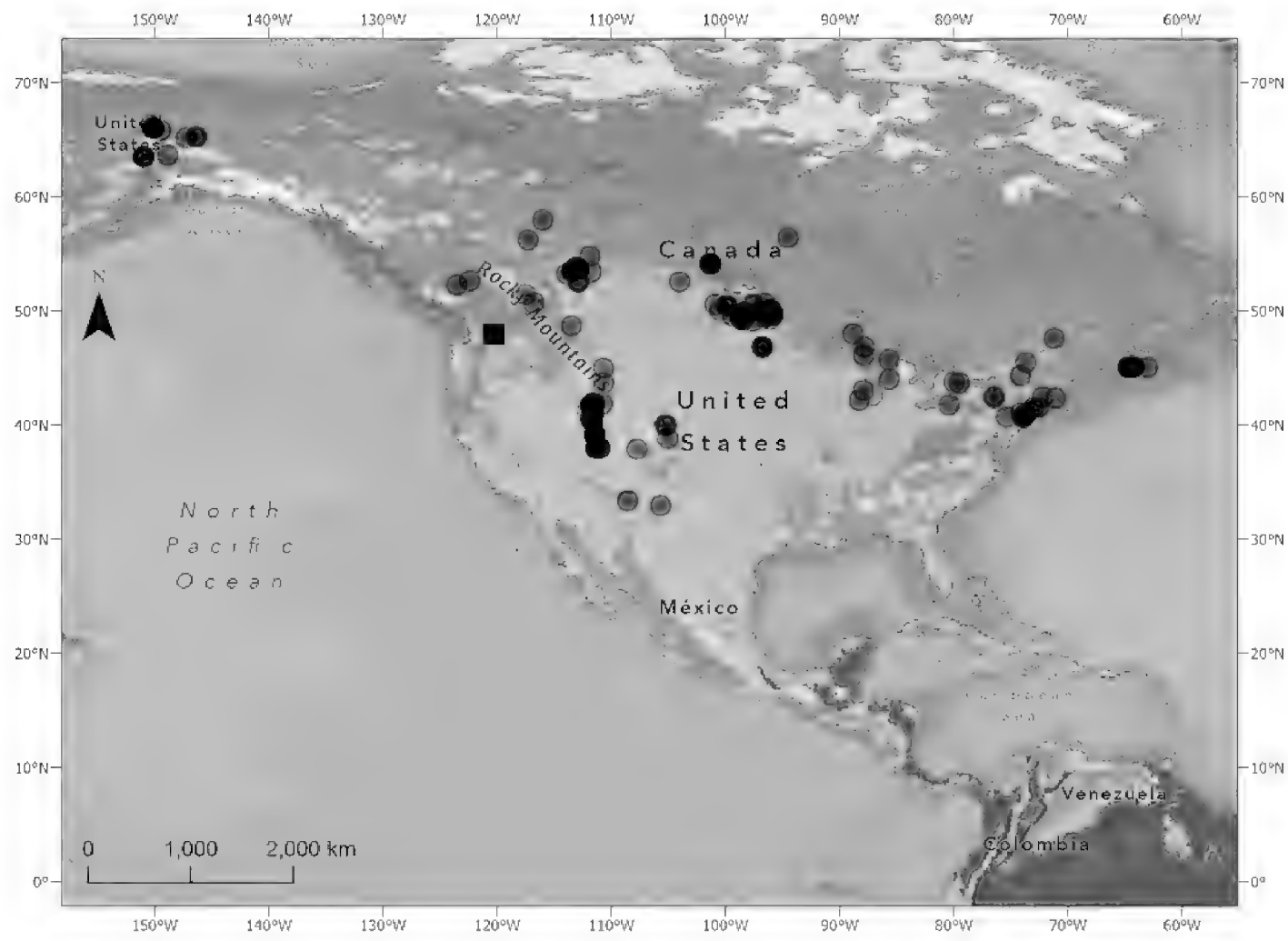

Figure 10. Known distribution of *Coelioxys funerarius* in North America (represented by gray circles) with new records in Washington state (black square). Known occurrence records were derived from Ikerd (2019), Gibbs (2024), Sikes (2024), Bentley and Falin (2025), and York University.

and Wilson 2023), suggesting an ability of both the hosts and parasite to recolonize a landscape from adjacent unburned landscapes within two years following moderate severity wildfire. *Coelioxys funerarius* was captured in a pan trap between the 12th and 13th of June 2023, which aligns with the known phenology of the genus to fly from late May to mid-September (Messinger Carril and Wilson 2023) with most specimens collected from mid-June through August (Baker 1975).

Dianthidium cressonii Dalla Torre, 1896

Figures 11, 12

New records ($n = 23♀, 12♂$). UNITED STATES OF AMERICA — **Washington** • Okanogan Wenatchee National Forest, Chelan Ranger District; Chelan County, Chelan; 47.9388°N, 120.0550°W; 850 m a.s.l.; 21–23 Jun 2021; A. Maust leg.; blue vanes; det. KW Wright 2024; 1♂, W21-0052 • ibid.; 47.9526°N, 120.0360°W; 1060 m a.s.l.; 21–23 Jun 2021; 1♀, 1♂, W21-0051, W21-0050 • ibid.; Ardenvoir; 47.7837°N, 120.4246°W; 1010 m a.s.l.; 1♀, 1♂, W21-0073, W21-0074 • ibid.; Chelan; 47.9826°N, 120.2978°W; 980 m a.s.l.; 1–3 August 2022; 1♀, 1♂, W22-0135. The remaining 29 specimens are summarized in Table 1.

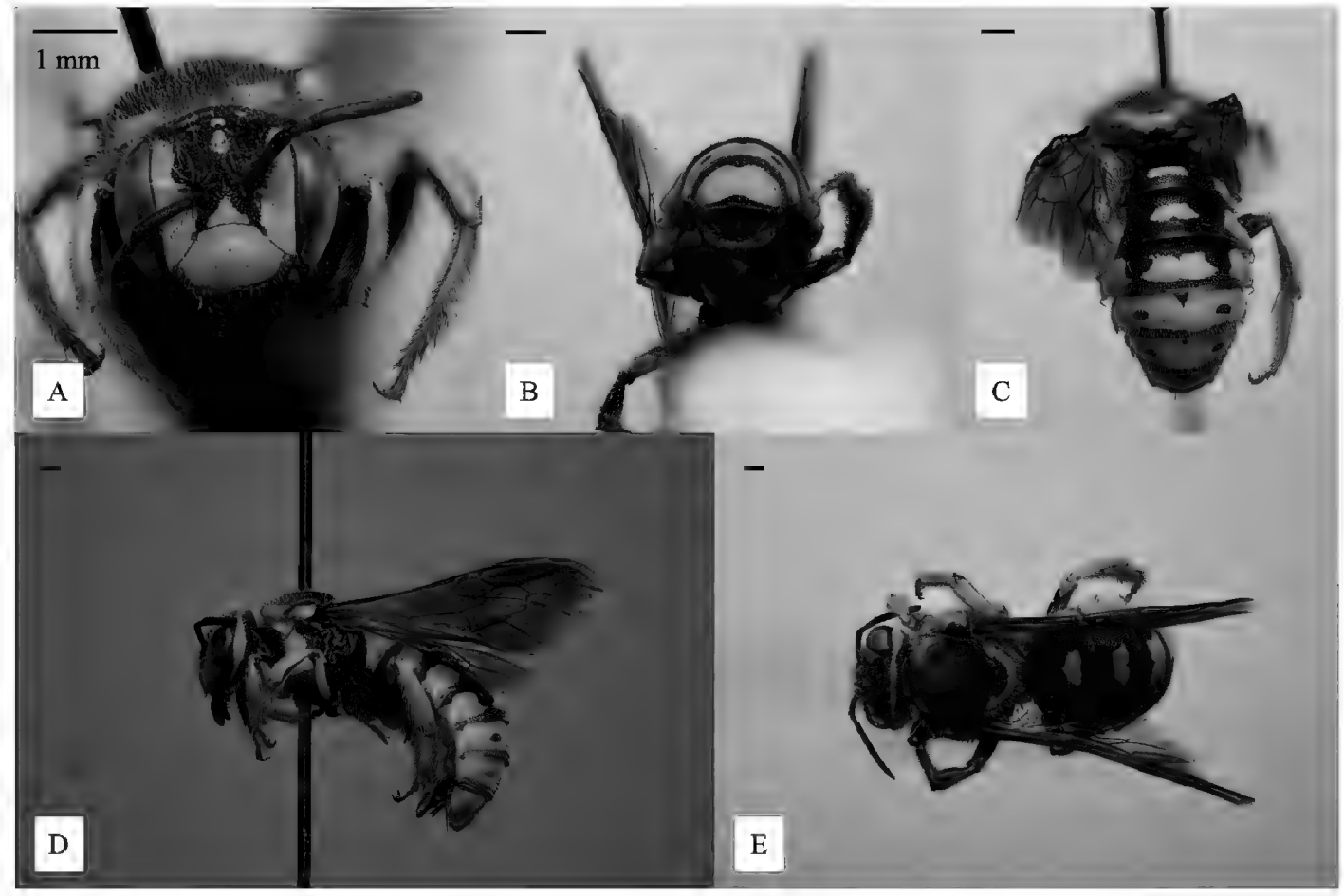

Figure 11. Female *Dianthidium cressonii*. **A.** Face, frontal view. **B.** Abdomen, dorsal view of T6. **C.** Abdomen, dorsal view of terga I–V. **D.** Lateral view. Black with yellow pubescence. Strong yellow maculations. Large, approximately 11 mm. **E.** Dorsal view, segment T2 three-spotted. Scale is approximate.

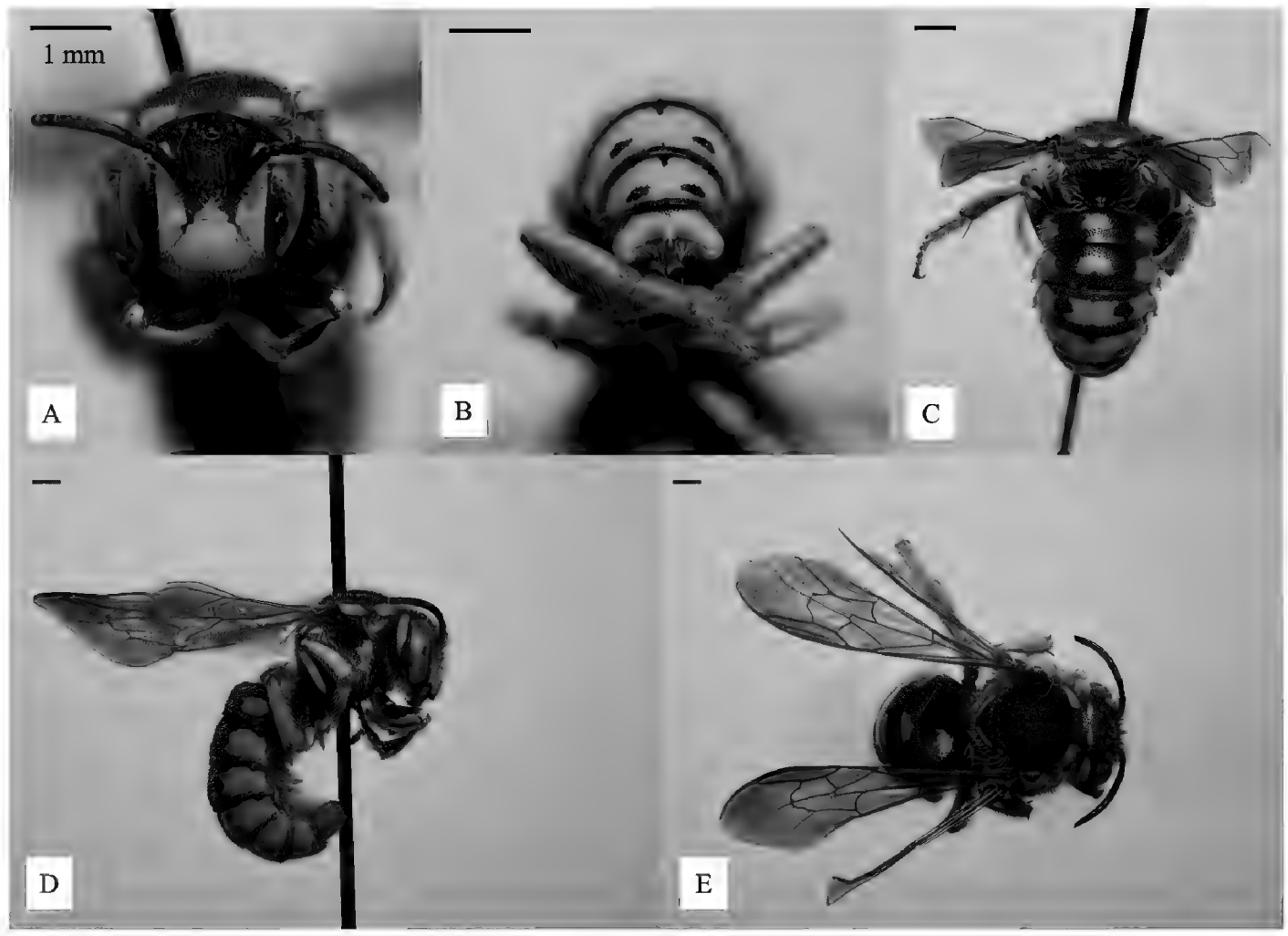

Figure 12. Male *Dianthidium cressonii*. **A.** Face, frontal view. **B.** Terminalia, dorsal view. **C.** Abdomen, dorsal view. Edges of tergites inflated. **D.** Lateral view, left. Spines on coxae unusually long. **E.** Dorsal view. Scale is approximate.

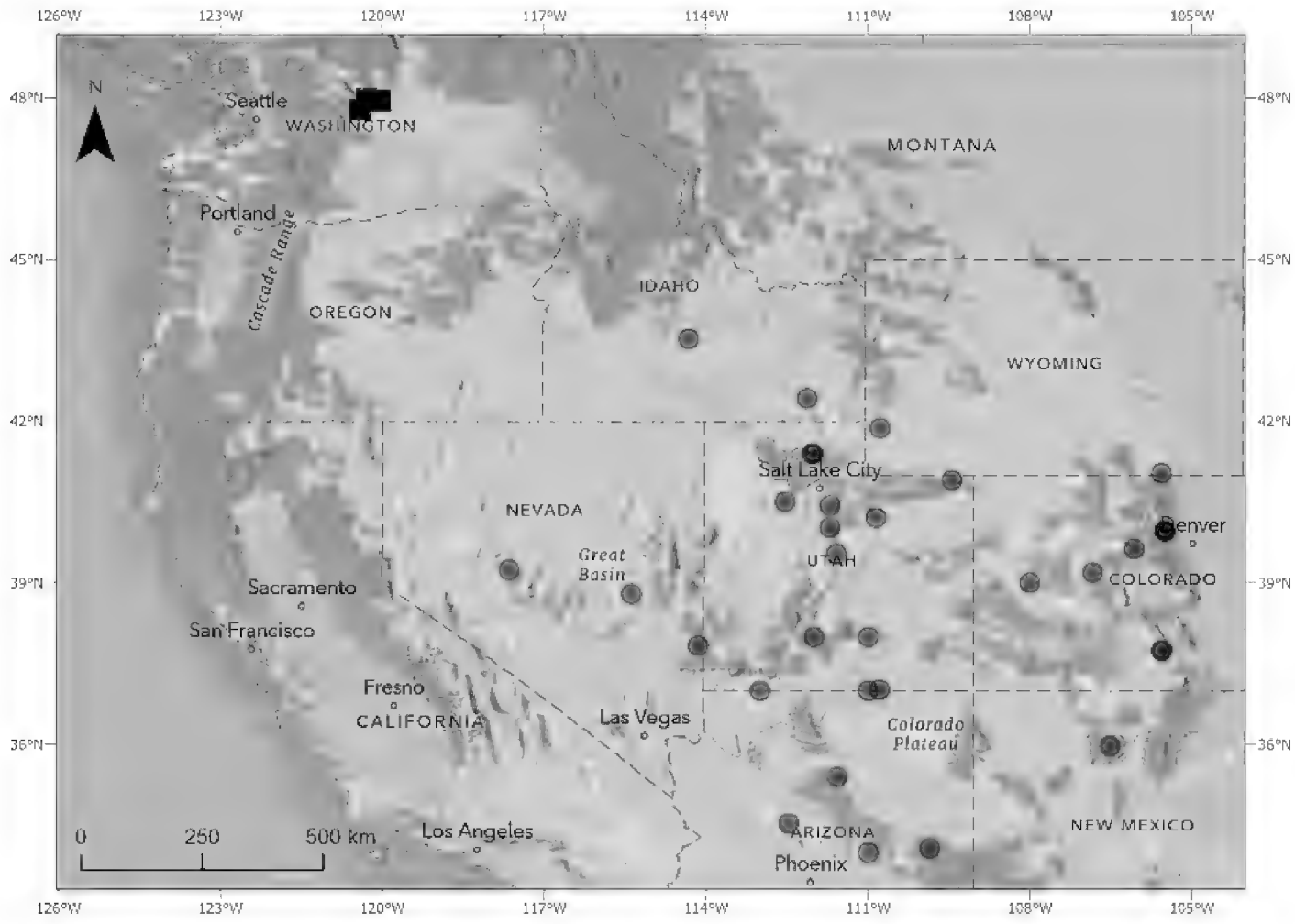

Figure 13. Known distribution of *Dianthidium cressonii* in North America (represented by gray circles) with new records in Washington state (black squares). Known occurrence records were derived from Ikerd (2019) and Johnson (2020).

Identification. Both sexes of *Dianthidium cressonii* are readily identified by the laterally inflated metasomal terga; the male additionally has the median process of T7 straight and parallel to the lateral lobes. *Dianthidium singulare* also shares these characters, but the lateral inflations of the metasomal terga are not as strongly developed in *D. cressonii* (about twice as large in *D. singulare*), and the apical margin of the female T6 is slightly more rounded (Grigarick and Stange 1968) (Figure 11B).

Distribution. According to Grigarick and Stange (1968: 54), "*D. cressonii* occurs in Colorado and Nevada and may eventually be found in eastern California". This hypothesis has not yet come to fruition, as there are no documented records of *D. cressonii* in the state of California (Figure 13). Schwarz (1926) cited *D. cressonii* as occurring only in Colorado and Utah. The nearest georeferenced record is from Blaine, Idaho (43.525°N, 114.321°W, Johnson 2020), ~664 km southeast of the study area. The farthest record is from Sandoval County, NM (35.9747°N, 106.5228°W, leg. 2009, det. K.T. Huntzinger 2011, Ikerd 2019), ~1,735 km southeast of the study area.

Habitat. *Dianthidium* Cockerell, 1900 is known to construct nests of gravel or pebbles on branches and rock surfaces using mud and resin, or more rarely, build nests in the ground (Messinger Carril and Wilson 2023). Though the specific nesting preferences of *Dianthidium cressonii* are unknown, the closely related *Dianthidium singulare* nests on rock surfaces (Grigarick and Stange 1968). The presence of *D. cressonii* one year post fire, coupled with known similarities among nesting preferences of related species, suggest that *D. cressonii* is likely a rock surface nesting species with a rapid recolonization rate to post-fire areas.

Remarks. *Dianthidium cressonii* was the most abundant new record identified in this study, with 35 specimens recorded. It was collected each year of sampling (2021–2023) across all four sites with both blue vane and pan traps between early June and early August. *Dianthidium cressonii* was found both in landscapes that had recently burned (1–3 years post fire) and landscapes that had not burned in more than 50 years (Figure 1), suggesting a lack of dependency on disturbance for survival. Notably, *D. cressonii* was found approximately one year post fire (August 2022) within the burn perimeter of the aforementioned Twentyfive Mile Creek Fire. Arid deserts associated with *D. cressonii* span the western United States and have climatic and vegetative similarities. Thus, it is probable that *D. cressonii* is distributed throughout temperate desert ecosystems across the Northern Basin and Range ecoregion and into the Columbia Plateau. The comparatively common occurrence of newly documented *D. cressonii* on the landscape highlights the need for species level identification and long-term monitoring of bee populations across Washington state to ensure native bee biodiversity can be effectively protected.

***Dianthidium singulare* Cresson, 1879**

Figure 14

New record. UNITED STATES OF AMERICA — **Washington** • Okanogan Wenatchee National Forest, Chelan Ranger District; Chelan County, Chelan; 47.9403°N, 120.0418°W; 960 m a.s.l.; 1–3 Aug 2022; A. Maust leg.; pan traps; det. A. Maust 2024; 1♀, W22-0142.

Identification See the identification of *D. cressonii* above.

Distribution. *Dianthidium singulare* has been frequently reported in the mountainous regions of eastern and southern California and is collected less frequently in Nevada (Grigarick and Stange 1968). There are three records of *D. singulare* from Osoyoos, British Columbia, which is ~130 km north of the collection location (49.0069°N, 119.488°W, Sheffield 2019). The known distribution of *Dianthidium singulare* in North America is shown in Figure 15.

Habitat. *Dianthidium singulare* constructs individual cells from resin and pebbles to nest on the surface of rocks (Grigarick and Stange 1968). The limited foraging records associated with *D. singulare* suggest a floral preference for Asteraceae, which is abundant on the study landscape (personal observation). Specifically, Arrowleaf Balsamroot (*Balsamorhiza sagittata*) is the main floral resource early in the season (personal observation). More recently, Sheffield and Heron (2018) reported *D. singulare* as associated with the Western Interior Basin ecozone. This ecozone includes the lower Okanagan Valley dominated by Antelope Bitterbrush

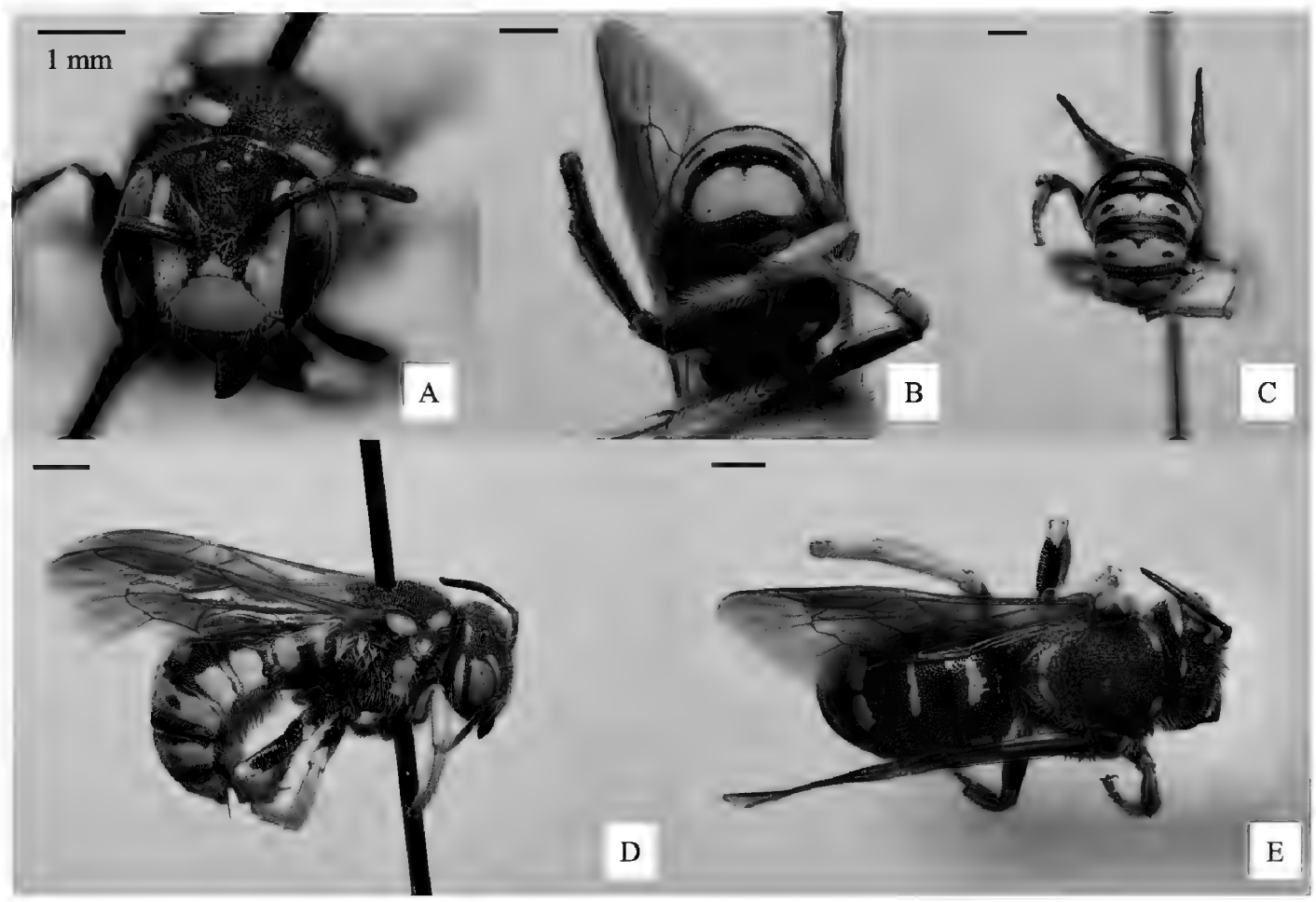

Figure 14. Female *Dianthidium singulare*. **A.** Face, frontal view. **B.** Abdomen, dorsal view. T6 shape rectangular. **C.** Abdomen, dorsal view. Maculations bright yellow. **D.** Lateral view. Lateral margins of terga decreasingly inflated. **E.** Thorax, dorsal view. Scale is approximate.

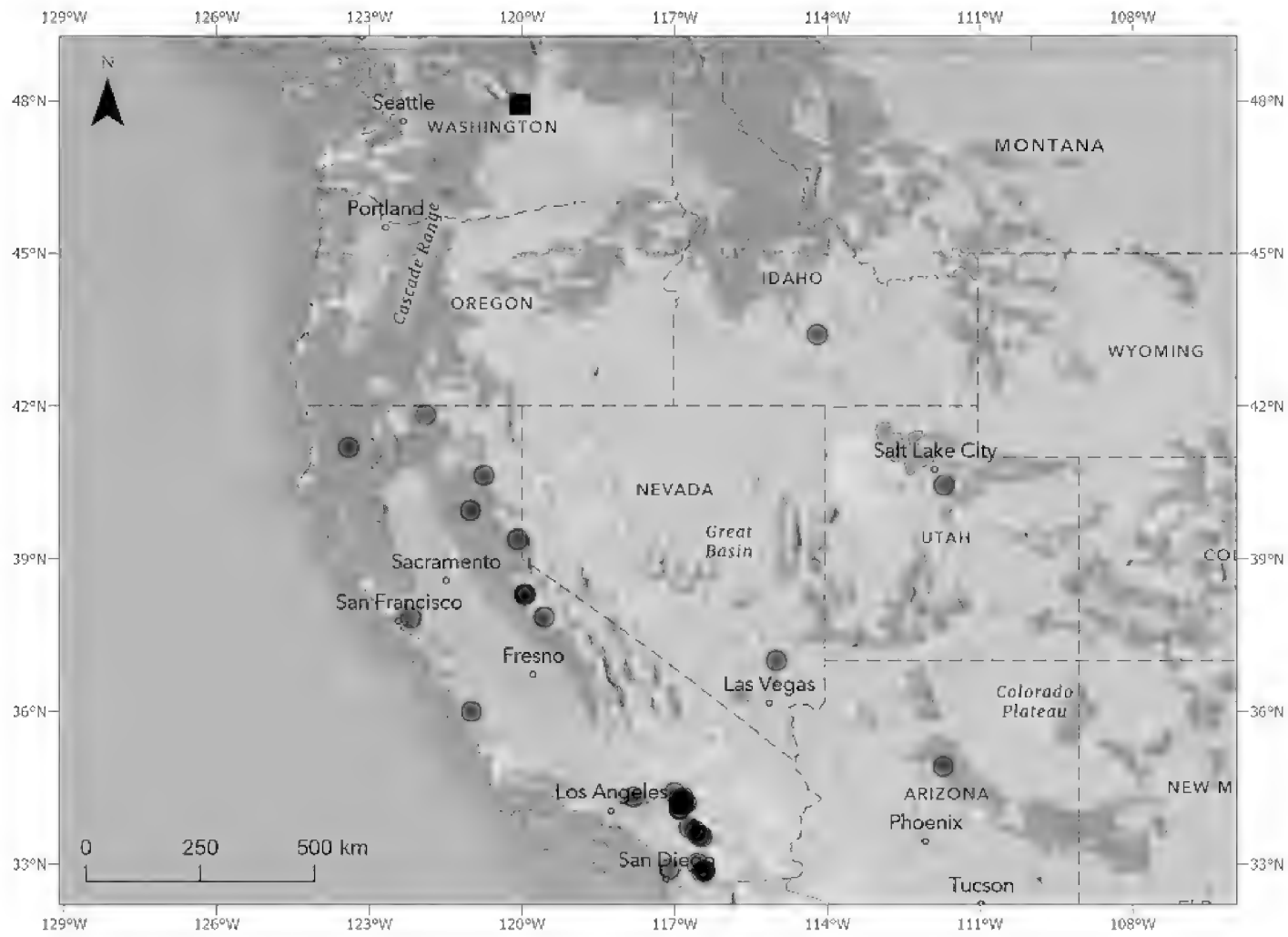

Figure 15. Known distribution of *Dianthidium singulare* in North America (represented by gray circles) with new records in Washington state (black square). Known occurrence records were derived from Sheffield (2019) and Ikerd (2019).

(*Purshia tridentata* Pursh, Rosaceae) in British Columbia. *Purshia tridentata* was present across the study area (personal observation; Consortium of Pacific Northwest Herbaria 2024) and thus reflects the landscape traits associated with this species.

***Osmia cyaneonitens* Cockerell, 1906**

Figure 16

New record. UNITED STATES OF AMERICA — **Washington** • Okanogan Wenatchee National Forest, Chelan Ranger District; Chelan County, Chelan; 47.9526°N, 120.0360°W; 1060 m a.s.l.; 29–30 May 2023; A. Maust leg.; blue vanes; det. J. Gardner 2024; 1♀, AM23-0542.

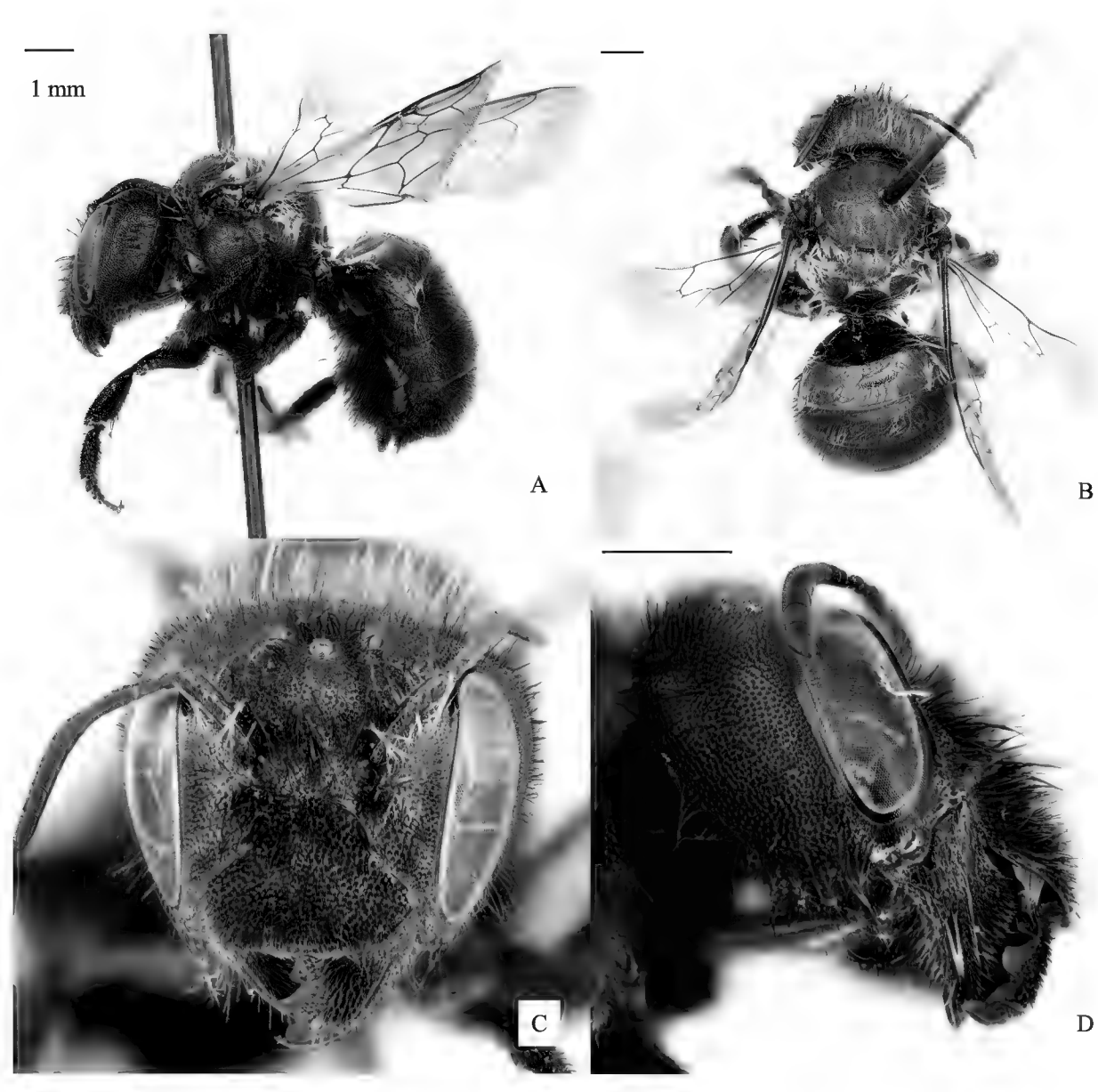

Figure 16. Female *Osmia cyaneonitens*. **A.** Lateral view. **B.** Dorsal view. **C.** Face, frontal view. Coarse punctures and proclinate bristles on the face, mandibles wide apically. **D.** Face, lateral view. High projection of the hypostomal carina.

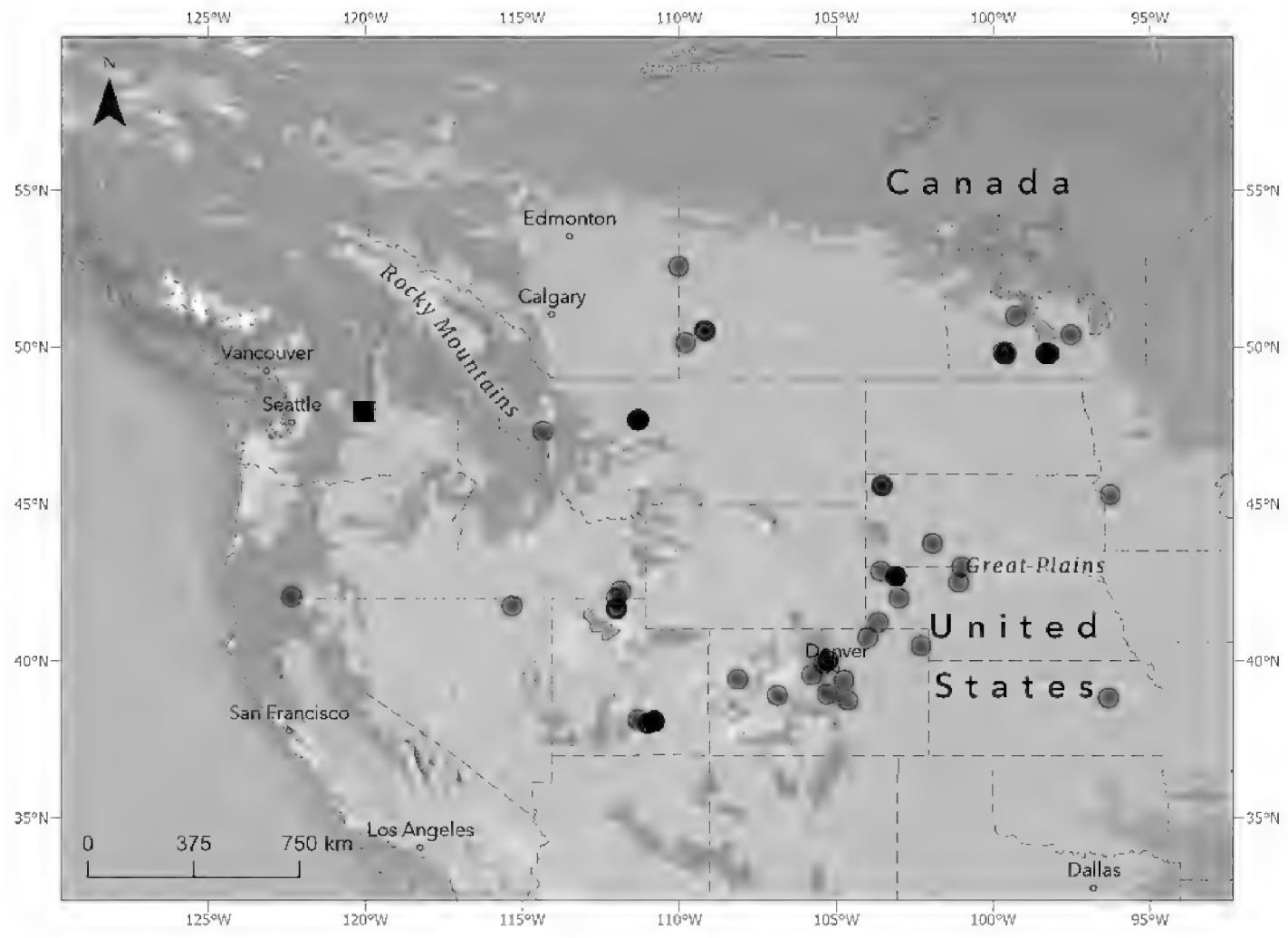

Figure 17. Known distribution of *Osmia cyaneonitens* in North America (represented by gray circles) with new records in Washington state (black square). Known occurrence records were derived from Ikerd (2019), Ikerd and Engler (2023), and Gibbs (2024).

Identification. Female *O. cyaneonitens* are distinguished by the presence of coarse, proclinate bristles on the frons (similar to those in *O. brevis* and *O. pentstemonis*), apically broadened mandibles (similar to the "*Acanthosmioides*" group of species), and high hypostomal carina abruptly reduced at the lateral angle (Sandhouse 1939).

Distribution. The distributional range of *O. cyaneonitens* spans North America and stretches from California east to Kanas, USA and north to Manitoba, Canada (Figure 17). The closest georeferenced specimen was collected in southern British Columbia, which is at least 116 km from the collection location (Elwell et al. 2016). Across British Columbia, *O. cyaneonitens* has been reported to reside in the Western Interior Basin ecozone, which is comparable to the plant communities found in the Okanogan Wenatchee National Forest (Sheffield and Heron 2018; Ikerd 2019). The next nearest georeferenced specimens are from Sanders County, Montana, USA which is at least 325 km east of the collection site (Ikerd and Engler 2023).

Remarks. Idaho Fish and Game regards *O. cyaneonitens* as native to Idaho, though only in the southeastern corner of the state (2024). Its conservation rank according to this source is G3G4, which means it is rare or uncommon, but not imperiled. Discover Life (2024) cites the floral hosts for this species as Fabaceae and Scrophulariaceae, which are present on the collection landscape (Consortium of Pacific Northwest Herbaria 2024; personal observation). Specifically, *O. cyaneonitens* is a known pollinator of *Penstemon* Schmidel species, including Blowout Penstemon (*Penstemon haydenii* S. Watson, Plantaginaceae; Tepedino et al. 2006; Tepedino et al 2006), which is considered Endangered by the United States Fish and Wildlife Service (1987). The *O. cyaneonitens* specimen collected in this study was found in a landscape that was 8 years post-fire. The nesting habitat for this species is unknown.

***Stelis heronae* Sheffield, 2024**

Figures 18, 19

New records ($n = 2♂$). UNITED STATES OF AMERICA — **Washington** • Okanogan Wenatchee National Forest, Chelan Ranger District; Chelan County, Chelan; 47.9388°N, 120.0550°W; 850 m a.s.l.; 10–11 Jul 2023; A. Maust leg.; pan traps; det. T. Griswold 2024; AM23-1730 and AM23-1732.

Two additional female *S. heronae* specimens were collected in 2022, but due to a database error their specific locations within the Okanogan–Wenatchee National Forest in Chelan County, Washington cannot be determined. One specimen was collected between 18 July and 1 August (AM22-0597), the other was collected between 5 July and 1 August (AM22-1314).

Identification. Females of *S. heronae* are distinguished from other western species in *Stelis* Panzer, 1806 by the pale maculations on terga 1–4 or 5. *Stelis anasazi* closely resemble *S. heronae*, but *S. anasazi* only has pale maculations on terga 1–3 (Sheffield 2024).

Taxonomic remarks. *Stelis heronae* was separated from other members of the *Stelidium* group by Sheffield (2024).

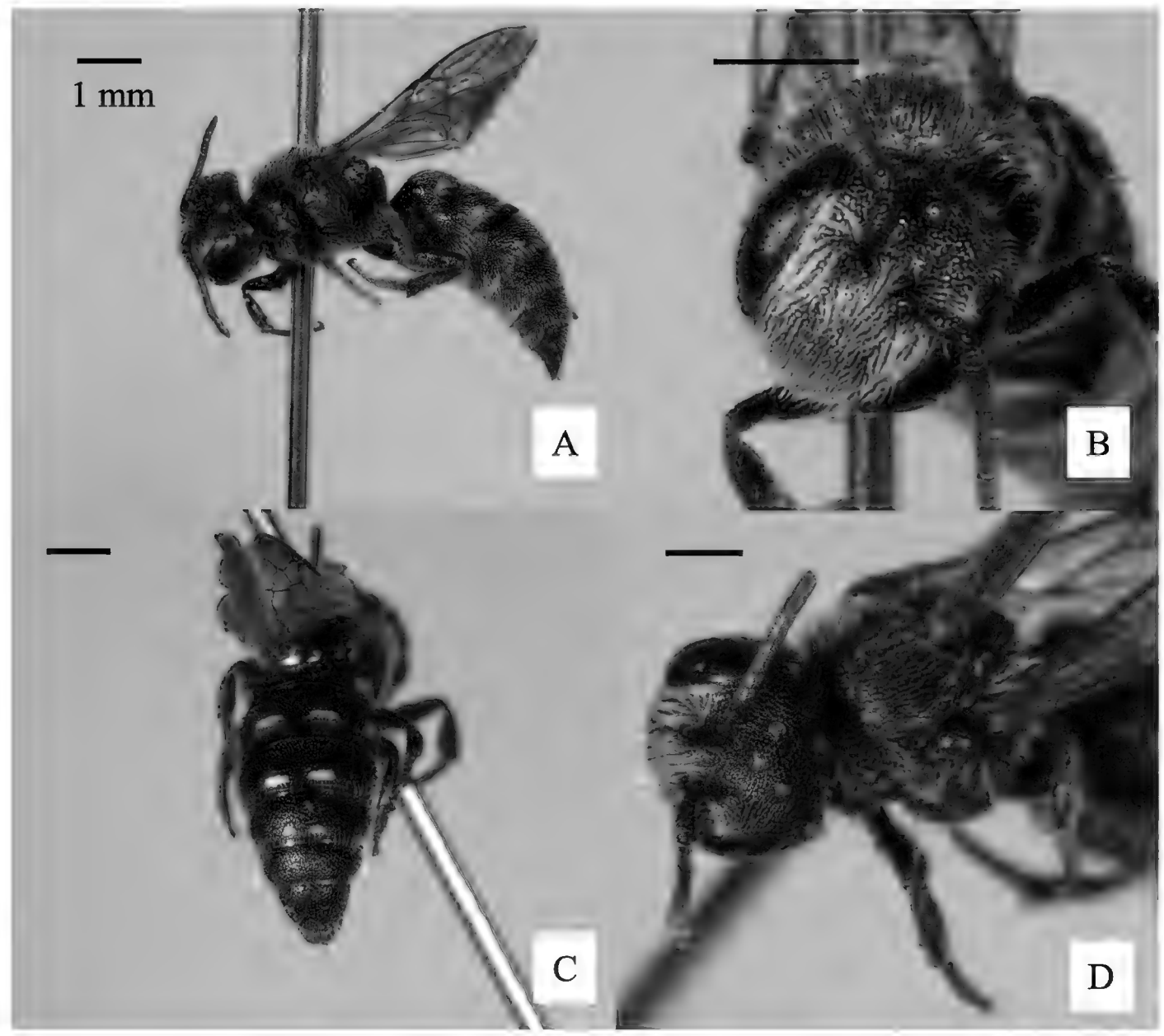

Figure 18. Female *Stelis heronae*. **A.** Lateral view, left. **B.** Face, frontal view. Clypeus entirely black. **C.** Abdomen, dorsal view. Pale maculations on terga I–IV. **D.** Ocelli, frons, vertex. Dorsal view. Ocelli normal sized. Upper frons and vertex densely punctate. Pronotal lobe and tegula black. Scale is approximate.

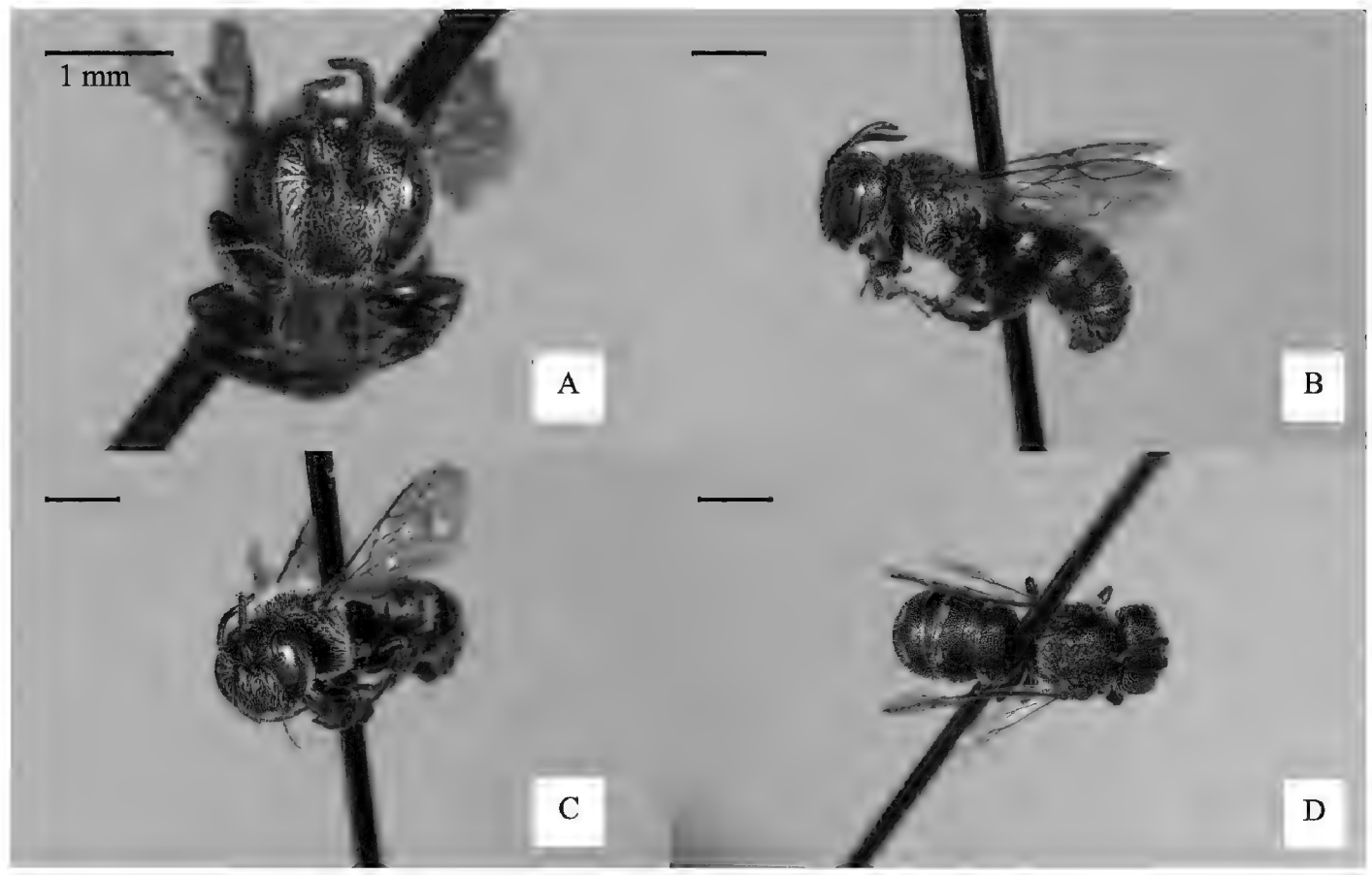

Figure 19. Male *Stelis heronae*. **A.** Face, frontal view. Clypeus black. **B.** Lateral view, left. Maculations visible. **C.** Face and lateral view, left. **D.** Dorsal view, scutum and abdominal maculations visible. Scale is approximate.

Distribution. Three *S. heronae* types were collected in southern British Columbia from Lillooet (50°54′46.1″N, 122°14′17.7″W, leg. Bennett, Copley, and Copley 2012), Kelowna (49.8111°N, 119.4402°W, leg. Dawson and Heron 2016), and Vaseux Lake (49.2614°N, 119.508°W, leg. Packer 2009) which are at least 338 km north, 222 km northeast, and 162 km northeast of the study area, respectively (Figure 20). *Stelis heronae* is distributed across the western interior basin ecozone of southern British Columbia for which similarities to the study area have been noted. Specimens for this study were collected in July of 2022 and 2023, which aligns with the docu-

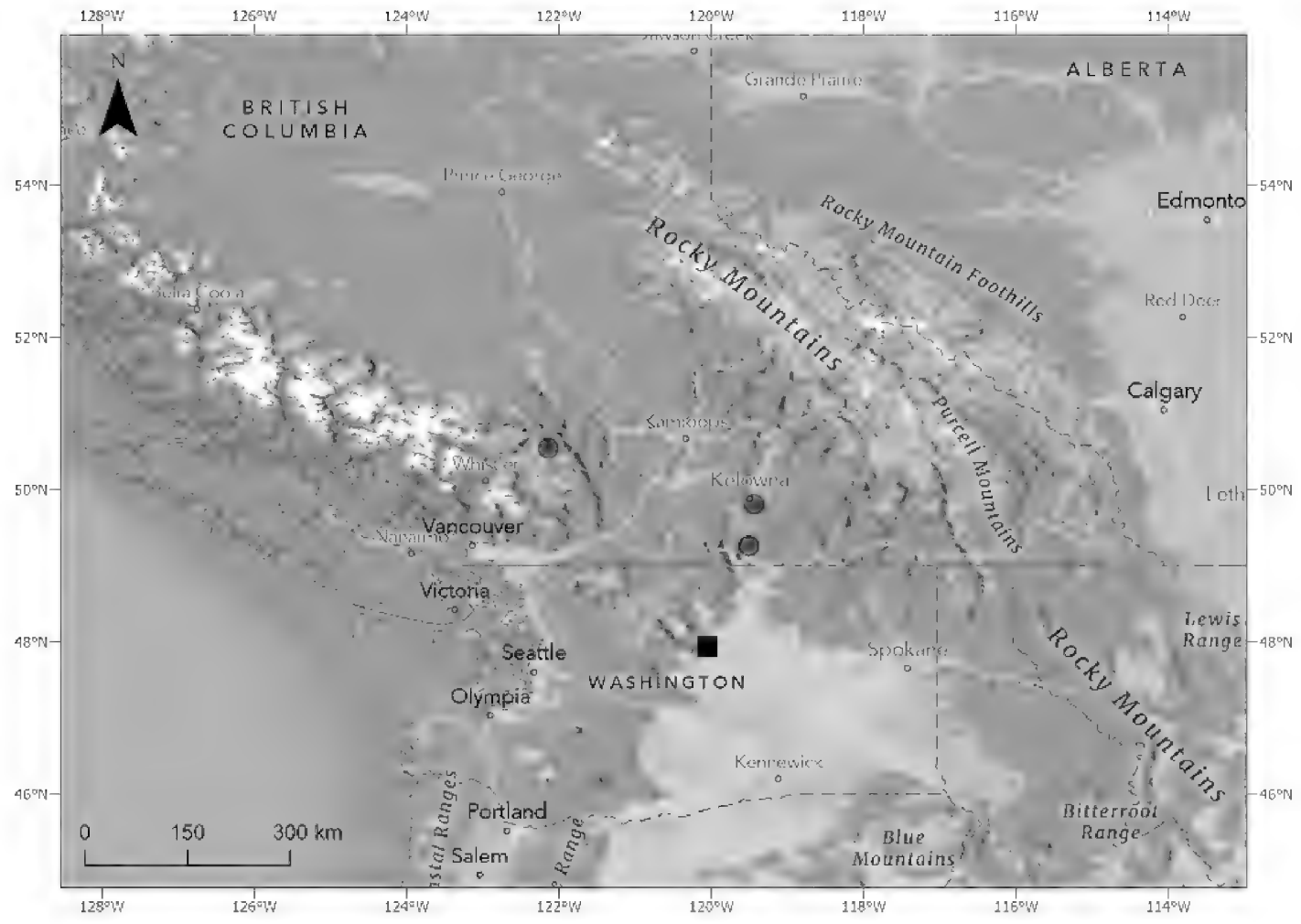

Figure 20. Known distribution of *Stelis heronae* in North America (represented by gray circles) with new records in Washington state (black square). Known occurrence records were derived from Sheffield (2024).

mented phenology of the species (Sheffield 2024).

DISCUSSION

Washington state contains a vast array of ecosystems that vary topographically, climatically, and vegetatively (Franklin and Dryness 1973). Each system has a unique associated bee community (Cane 2011; Looney and Eigenbrode 2012; Orr et al. 2021). There is a deficit of species level bee data in some regions of Washington, USA, as exemplified by the 100 new records for Chelan County resulting from this study. Therefore, it is likely that continued fine-scale bee diversity research and repeated monitoring in undersampled regions will reveal new records. Furthermore, climate shifts may result in less suitable habitat for key forest species across the state (Littell et al. 2010). Thus, this study provides a reference of bee distributional ranges in anticipation of further environmental changes, such as those resulting from increased habitat loss and climate change. We specifically examined the effects of fire on bee communities and used known nesting information to infer recolonization and survival following disturbance. Understanding the geographic distribution of native forest bee species facilitates targeted conservation and restoration efforts for both native bees and associated foraging and nesting plants. This is particularly critical for rare, native pollinators with highly specialized relationships to floral hosts.

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ADDITIONAL INFORMATION

Conflict of interest

The authors declare that no competing interests exist.

Ethical statement
No ethical statement is reported.

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Data availability
All data that supports the findings of this study are available in the main text and appendix. The complete raw data is deposited in Symbiota Collections of Arthropods Network (SCAN).

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APPENDIX

Table A1. Taxonomic keys used for species level identification of Hymenoptera, Anthophila species in Washington, USA. Species level identifications were determined by Autumn Maust (AM), Joel Gardner (JG), Karen W. Wright (KW), and Terry Griswold (TG). Genera for which the determiner listed is N/A did not have available keys and therefore were not identified to the species level. Identification to genera was completed using the CANPOLIN Bee Genera key (AM).

Family	Genus	Taxonomic key	No. of individuals	Determiner (year)
Andrenidae	*Andrena*	Ribble 1968; Bouseman and Laberge 1973, 1977, 1980, 1985, 1989; LaBerge 1978; Michener 2007	153	JG (2023)
	Panurginus	Michener 1935	52	JG (2023)
	Perdita	Timberlake 1954-1980	34	KW/TG (2024)
Apidae	*Anthophora*	Ascher and Pickering 2016; Discover Life 2024	31	AM/KW (2023)
	Apis	CANPOLIN Bee Genera	27	AM (2023)
	Bombus	Williams et al. 2014	572	AM (2023)
	Ceratina	Daly 1973	14	KW (2024)
	Diadasia	Sipes 2001	5	KW (2024)
	Eucera	Timberlake 1969	56	KW (2024)
	Habropoda	Discover Life 2024	2	AM/KW (2024)
	Melecta	Discover Life 2024	16	AM (2023)
	Melissodes	LaBerge 1956, 1961*	33	KW (2024)
	Nomada	Key not available	2	N/A
Colletidae	*Colletes*	Stephen 1954	4	KW (2024)
	Hylaeus	Snelling 1966; Snelling 1970	39	KW/JG (2024)
Halictidae	*Agapostemon*	Roberts 1973; Portman et al. 2024	542	AM/KW/JG (2024)
	Dufourea	Bohart 1948; Dumesh and Sheffield 2012*	5	KW (2024)
	Halictus	Roberts 1973	1,734	AM (2023)
	Lasioglossum	McGinley 1986; Gardner and Gibbs 2022	1,475	JG/AM (2023)
	Sphecodes	Key not available	8	N/A
Megachilidae	*Anthidium*	Gonzalez and Griswold 2013; Burrows et al. 2021	13	AM (2024)
	Ashmeadiella	Michener 1939	3	AM/TG (2024)
	Atoposmia	Hurd and Michener 1955*	4	TG (2024)
	Coelioxys	Baker 1975*	2	TG (2024)
	Dianthidium	Schwarz 1926*; Grigarick and Stange 1968*	65	AM/KW (2024)
	Heriades	Hurd and Michener 1955	1	TG (2024)
	Hoplitis	Discover Life 2024	161	AM/JG/TG (2024)
	Megachile	Sheffield et al. 2011	130	AM/TG (2024)
	Osmia	Sandhouse 1939*; Rightmyer et al. 2010	480	JG/AM/TG (2024)
	Protosmia	CANPOLIN Bee Genera	5	AM (2023)
	Stelis	Michener 2007; Sheffield 2024*	8	TG (2024)
	Triepeolus	Key not available for males	1	N/A

*Key used to identify new Washington, USA records.

Table A2. Sampling of Okanogan–Wenatchee National Forest bee fauna from 2021–2023 yielded 5,676 bee specimens representing 32 genera and 201 species. Species that have not been documented in Washington, USA since before the year 2000 have been annotated (Bartholomew et al. 2024). Of the specimens collected, 1,885 individuals (33.21%) are new records for Chelan County and 58 individuals (1.02%) are new records for the state of Washington.

Family	Species	No. collected			Total
		2021	2022	2023	
Andrenidae	*Andrena angustitarsata*	2	1	0	3
	Andrena astragali	0	0	1	1
	Andrena buckelli	1	0	0	1
	Andrena candida	0	0	1	1
	Andrena candidiformis	0	3	1	4
	Andrena cleodora	0	1	0	1
	Andrena lawrencei	0	6	1	7
	Andrena lupinorum	3	0	0	3
	Andrena melanochroa	3	2	2	7
	Andrena microchlora	1	0	0	1
	Andrena nigrocaerulea	0	3	2	5
	Andrena nivalis	1	5	1	7
	Andrena pallidifovea	1	5	1	7
	Andrena pertristis	2	0	0	2
	Andrena prunorum	23	34	34	91
	Andrena quintiliformis	0	5	0	5
	Andrena salicifloris	1	1	0	2
	Andrena schuhi	1	0	0	1
	Andrena (*Trachandrena*) sp. 1	0	1	0	1
	Andrena (*Trachandrena*) sp. 2	0	0	1	1
	Andrena trevoris	0	1	0	1
	Andrena vicinoides	0	1	0	1
	Panurginus atriceps	0	6	1	7
	Panurginus nigrellus	1	7	1	9
	Panurginus spp.	25	3	8	36
	*Perdita nevadensis nevadensis**	1	0	2	3
	Perdita aff. *tortifoliae*	6	0	8	14
	Perdita wyomingensis sculleni	9	0	5	14
	Perdita aff. *wyomingensis*	1	0	2	3
Apidae	*Anthophora bomboides*	3	1	0	4
	Anthophora porterae	5	4	6	15
	Anthophora terminalis	0	1	1	2
	Anthophora urbana	4	4	2	10
	Apis mellifera	5	10	12	27
	Bombus appositus	19	28	20	67
	Bombus centralis	84	26	72	182
	Bombus fervidus	36	42	45	123
	Bombus insularis	3	3	0	6
	Bombus melanopygus	0	2	0	2
	Bombus mixtus	2	0	0	2
	Bombus nevadensis	0	0	3	3
	Bombus rufocinctus	2	2	2	6
	Bombus sp. 1	1	0	0	1

Family	Species	No. collected			Total
		2021	2022	2023	
	Bombus sp. 2	1	0	0	1
	Bombus sylvicola	1	0	1	2
	Bombus vancouverensis	28	21	24	73
	Bombus vandykei	13	23	14	50
	Bombus vosnesenskii	8	18	28	54
	Ceratina nanula	5	1	2	8
	Ceratina sequioae[†]	2	1	3	6
	Diadasia diminuta	1	0	0	1
	Diadasia nitidifrons[‡]	2	1	1	4
	Eucera actuosa	0	1	0	1
	Eucera delphinii	1	7	1	9
	Eucera edwardsii	8	28	9	45
	Eucera fulvitarsis	0	0	1	1
	Habropoda ?cineraria	0	0	1	1
	Habropoda morrisoni[§]	0	0	1	1
	Melecta pacifica	4	1	9	14
	Melecta seperata	1	1	0	2
	Melissodes agilis	0	0	3	3
	Melissodes communis	0	10	0	10
	Melissodes grindeliae/ robustior	0	1	0	1
	Melissodes lupinus	0	0	1	1
	Melissodes microstictus	5	1	5	11
	Melissodes nigracauda	5	1	1	7
	Nomada spp.	0	0	2	2
Colletidae	*Colletes consors*	0	1	0	1
	Colletes fulgidus	0	1	2	3
	Hylaeus affinis[¶]	0	0	3	3
	Hylaeus ?conspicuus	14	0	3	17
	Hylaeus ?polifolii	0	1	0	1
	Hylaeus ?rudbeckiae	0	2	0	2
	Hylaeus spp.	3	1	1	5
	Hylaeus wootoni	5	2	4	11
Halictidae	*Agapostemon femoratus*	0	0	5	5
	Agapostemon subtilior	163	52	321	536
	Agapostemon virescens	0	0	1	1
	Dufourea dilatipes	0	1	4	5
	Halictus confusus	1	2	5	8
	Halictus farinosus	154	218	381	753
	Halictus ligatus	0	1	2	3
	Halictus rubicundus	7	5	5	17
	Halictus tripartitus	328	167	457	952
	Halictus virgatellus	0	0	1	1
	Lasioglossum albohirtum	1	2	3	6
	Lasioglossum anhypops	4	17	27	48
	Lasioglossum aspilurum[#]	1	1	2	4
	Lasioglossum athabascense	8	10	7	25
	Lasioglossum buccale[**]	8	2	10	20

Family	Species	No. collected			Total
		2021	2022	2023	
	Lasioglossum cf. *cooleyi*	32	121	47	200
	Lasioglossum egregium	5	18	5	28
	Lasioglossum foxii grp.	1	0	2	3
	Lasioglossum fratellum grp.	2	0	2	4
	Lasioglossum glabriventre	13	25	59	97
	Lasioglossum helianthi	2	0	3	5
	Lasioglossum incompletum	2	0	2	4
	Lasioglossum inconditum††	0	11	1	12
	Lasioglossum knereri	2	3	20	25
	Lasioglossum macroprosopum	15	9	22	46
	Lasioglossum marinense	1	0	1	2
	Lasioglossum mellipes	13	16	15	44
	Lasioglossum nevadense	115	124	231	470
	Lasioglossum nigroviride	0	0	6	6
	Lasioglossum ovaliceps	1	2	1	4
	Lasioglossum pacificum	0	0	2	2
	Lasioglossum prasinogaster	6	6	7	19
	Lasioglossum pruinosum	1	0	2	3
	Lasioglossum punctatoventre	15	16	27	58
	Lasioglossum reasbeckae	1	1	6	8
	Lasioglossum cf. *ruficorne*	4	1	3	8
	Lasioglossum ruidosense	14	7	5	26
	Lasioglossum sandhousiellum	19	4	9	32
	Lasioglossum sedi	2	2	10	14
	Lasioglossum sisymbrii	18	22	22	62
	Lasioglossum (*Sphecodogastra*) sp. 1	2	7	5	14
	Lasioglossum (*Sphecodogastra*) sp. 2	2	16	11	29
	Lasioglossum (*Sphecodogastra*) sp. 3	1	10	0	11
	Lasioglossum (*Sphecodogastra*) sp. 4	0	5	0	5
	Lasioglossum (*Sphecodogastra*) sp. 5	14	16	8	38
	Lasioglossum (*Sphecodogastra*) sp. 6	33	2	2	37
	Lasioglossum spp.	1	8	0	9
	Lasioglossum trizonatum	14	22	11	47
	Sphecodes sp. 1	1	0	0	1
	Sphecodes sp. 2	1	0	3	4
	Sphecodes sp. 3	0	1	1	2
	Sphecodes spp.	0	0	1	1

Family	Species	No. collected			Total
		2021	2022	2023	
Megachilidae	*Anthidium banningense*	2	0	3	5
	Anthidium formosum	1	0	2	3
	Anthidium mormonum	2	0	0	2
	Anthidium utahense	0	1	1	2
	Anthidium sp. 1	1	0	0	1
	Ashmeadiella californica	1	0	0	1
	Ashmeadiella cubiceps cubiceps	0	1	0	1
	Atoposmia abjecta abjecta	3	0	1	4
	Atoposmia elongata	1	0	0	1
	Coelioxys funerarius	0	0	1	1
	Coelioxys octodentata	0	1	0	1
	Dianthidium cressonii	21	9	5	35
	Dianthidium heterulkei	1	1	1	3
	Dianthidium pudicum	3	1	0	4
	Dianthidium singulare	0	1	0	1
	Dianthidium subparvum	8	5	8	21
	Dianthidium ulkei	1	0	0	1
	Heriades carinatus	0	1	0	1
	Hoplitis albifrons	64	42	41	147
	Hoplitis fulgida fulgida	3	3	1	7
	Hoplitis hypocrita	0	0	1	1
	Hoplitis producta	2	0	0	2
	Hoplitis sambuci	0	2	2	4
	Megachile angelarum	0	1	0	1
	Megachile apicalis	0	0	1	1
	Megachile brevis	0	1	5	6
	Megachile ?coquilletti	0	0	1	1
	Megachile gemula	0	1	0	1
	Megachile lapponica	0	1	0	1
	Megachile melanophaea	3	1	0	4
	Megachile montivaga	4	6	3	13
	Megachile onobrychidis	2	0	0	2
	Megachile pascoensis	11	7	6	24
	Megachile perihirta	21	27	20	68
	Megachile pugnata	0	1	3	4
	Megachile subnigra	1	0	2	3
	Megachile wheeleri	0	0	1	1
	Osmia albolateralis	5	16	25	46
	Osmia atrocyanea	11	40	53	104
	Osmia brevis	1	1	0	2
	Osmia bruneri	0	1	1	2
	Osmia bucephala	0	2	1	3
	Osmia cahuilla	0	0	1	1
	Osmia californica	13	37	57	107
	Osmia calla	1	1	3	5
	Osmia cara[#‡]	1	4	6	11
	Osmia *?*cara	0	1	1	2

Family	Species	No. collected			Total
		2021	2022	2023	
	Osmia cobaltina[§§]	1	3	2	6
	Osmia coloradensis	1	1	0	2
	Osmia cyanella	0	1	1	2
	Osmia cyaneonitens	0	0	1	1
	Osmia densa	0	4	11	15
	Osmia ?densa	0	1	0	1
	Osmia exigua	1	5	3	9
	Osmia juxta	2	2	4	8
	Osmia kincaidii	0	0	1	1
	Osmia marginipennis	0	1	3	4
	Osmia montana montana	5	15	108	128
	Osmia nanula	0	1	0	1
	Osmia nemoris	0	1	0	1
	Osmia nifoata	1	0	0	1
	Osmia ?nifoata	0	0	1	1
	Osmia proxima	1	0	0	1
	Osmia sedula	1	0	0	1
	Osmia simillima	0	0	1	1
	Osmia spp.	0	1	1	2
	Osmia texana	0	1	0	1
	Osmia trevoris	2	1	5	8
	Osmia ?vandykei	0	1	0	1
	Protosmia rubifloris	2	0	3	5
	Stelis heronae	0	2	2	4
	Stelis montana	1	1	1	3
	Stelis subcaerulea	0	1	0	1
	Triepeolus sp. 1	0	0	1	1

[*] *Perdita nevadensis*; not documented since 1949.
[†] *Ceratina sequioae*; not documented since 1919.
[‡] *Diadasia nitidifrons*; not documented since 1919.
[§] *Habropoda morrisoni*; not documented since 1995.
[¶] *Hylaeus affinis*; not documented since 1957.
[#] *Lasioglossum aspilurum*; not documented since 1973.
[**] *Lasioglossum buccale*; not documented since 1970.
[††] *Lasioglossum inconditum*; not documented since 1985.
[‡‡] *Osmia cara*; not documented since 1935.
[§§] *Osmia cobaltina*; not documented since 1977.